Next Generation Space Telescope

Integrated Science Instrument Module

Science Instruments
Data Requirements Document

DRAFT RELEASE 2

Goddard Space Flight Center
Greenbelt, Maryland 20771

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

This document is a Next Generation Space Telescope (NGST) controlled document. Changes to this document require prior approval of the NGST Project Manager. Proposed changes shall be submitted to the NGST Configuration Management Office (CMO), along with supportive material justifying the proposed change. Changes to this document will be made by complete revision.

Questions or comments concerning this document should be addressed to:

NGST Configuration Manager
NGST Configuration Management Office
Mail Stop TBD
Goddard Space Flight Center
Greenbelt, Maryland 20771

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

MODIFICATION LISTING

Draft Release 1 (10/26/01) to Draft Release 2 (11/28/01)

·	Multiple Documents	Removed "Science Instrument" form title – Section 4.0 added following note**:** **"**All Document Titles for Specific Instruments shall include the instrument name (NIRCam, NIRSpec, MIRI, FGS) as a preface to or the below listed document titles"
·	PM-16	Added Content – Transportation Plans, ISIM I&T Requirement
·	PM-17	Title Revised
·	PM-19	Title Revised
·	PM-21	Title Revised
·	SA-05	Content item 3 revised
·	SE-05	Title Revised
·	SE-06	Title Revised
·	SE-07	Title Revised
·	SI-03	New Document: Mass and Thermal Simulator for the Optics Assembly Report
·	SI-04	New Document: Instrument Control Electronics Simulator Report
·	SI-05	Renumbered, was SE-03
·	SI-06	Renumbered, was SE-04 - Title Revised - Description/contents revised
·	SI-07	Renumbered, was SE-05
·	SI-08	Renumbered, was SE-06 - Title Revised
·	OTE-01	Title Revised
·	OTE-02	Title Revised
·	FSW-06	Title Revised

Prepared by: _____ _____

Charles D Calhoon Jr — Date
Deputy ISIM Systems Engineer

Reviewed by:

_____ _____

Robert C. Smith — Date
ISIM Instrument Systems Manager

_____ _____

Tom Venator — Date
ISIM Shared Systems Manager

Approved By:

_____ _____

Name — Date
ISIM Project Manager

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

TABLE OF CONTENTS

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

LIST OF TABLES

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

1.0 INTRODUCTION

This document defines the requirements for all Science Instrument deliverable data. Both formal and informal data types are addressed. Delivery schedule, action required, Configuration Management control, and quantity to be delivered is found in the Science Instruments Deliverable Items List (DIL) (NGST-LIST-000742).

2.0 IDENTIFICATION

Each document is identified by one of the codes listed in Table 1 and are based on the subject content of the document.

Table 1 Document Code Identifiers

Document Code	Subject Content
PM	Project Management
SA	Systems Assurance
SE	Systems Engineering
IT	Integration & Test
OTE	Optical Telescope Element
SI	Science Instrument
FSW	Flight Software
GSW	Ground Software
OPS	Operations

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

3.0 GENERAL REQUIREMENTS

The following sections describe general requirements for contractor-delivered documentation. For a more specific description of requirements, please refer to the NGST Configuration Management Procedure (NGST-PROC-000654) and/or the NGST Data Management Procedure (NGST-PROC-000655).

3.1 DISTRIBUTION

All data deliverables shall be delivered to the NGST Data Management Office, in accordance with the applicable paragraph of Section 4 herein. All deliverables shall include a copy of the delivery letter. The Contractor shall send the Contracting Officer the original signed delivery letter. In designated cases, the Contractor shall also send the Contracting Officer's Technical Representative (COTR) a copy of the delivery letter. The delivery letter copies can be hard copy or electronic (the original, signed version, to be scanned and provided in Portable Data Format [PDF]).

The quantity of hard copies for specific deliverable items can be found in the Science Instruments Deliverable Items List (DIL) (NGST-LIST-000742).

Hard copies shall be sent to:

NASA/GSFC
NGST Project/ Code 443
Data Management Office
Goddard Space Flight Center
Greenbelt, MD 20771

3.2 DATA DELIVERABLE FORMATS

In general, outlines of documents in compliance with the content specification shall be submitted for approval by the COTR unless the contractor's format is accepted. Outlines do not normally undergo general distribution.

Documents that are under NGST Project control (see Science Instruments Deliverable Items List (DIL) NGST-LIST-000742) must comply with the formats specified in the NGST Project Configuration Management (CM) Procedure and the contractor's NGST Project-approved CM Plan. The NGST Project CM office (CMO) or NGST Project Data Management (DM) office (DMO) will make available the appropriate documentation format specified in those procedures and plans.

3.2.1 Electronic Copies

All electronic copies of documents and presentation materials shall be sent via email to the prescribed recipient(s). Documents should be in the most compatible version of Microsoft Word. Spreadsheets (tabular materials) should be in the most compatible version of Microsoft Excel. Presentation materials should be in the most compatible version of Microsoft PowerPoint. Additionally, the delivery of project schedules should use the most compatible version of Primavera Project Planner.

The "most compatible version" as well as the continued use of the Microsoft Office suite of products and Primavera Project Planner for support of electronic copies will change over time. Thus, the contractor and Contracting Officer should continue to evaluate and agree on the software and versions to use for electronic copies.

In some cases, alternative methods for the transfer of contractual documents may be necessary. For example, some of the files may be too large to send by email. When necessary, the contractor and Contracting Officer will agree on an alternative to the email method of document transfer. For the example of files too large to transfer via email, some possible solutions might include having an FTP

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

site set up on the contractor's server with folders designated for particular deliveries (i.e., PSR, MSR, etc.) or another method might be to save the large document to CD-ROM and delivered along with a delivery letter which includes an index of the content.

Engineering drawings generated and controlled by the contractor, which are part of a contract deliverable, shall be delivered in PDF and native format on CD-ROM along with an index that includes the drawing number, title, and latest revision.

.

3.2.2 Hard Copies

All hard copies of documents shall be in accordance with the following general specification:

a. Finish size: 8 1/2 x 11 inches.
b. Pages are printed on both sides, avoiding blanks if possible.
c. Oversize pages are to be avoided but, if necessary, will be folded to 8 1/2 x 11.

It is preferred that documents be supplied in reproducible (i.e. non-bound) format, unless otherwise specified. If binding is required, it should be the most economical method commensurate with the size of the document and its intended use.

All documents must be paginated.

All documents must have a "revision log" that identifies the dates and describes the update made to the each new version of the document.

Draft versions of documents need not conform to these specifications but they should be printed on 8 1/2 x 11 in. paper and be sufficiently clear to reproduce on office copiers.

In addition, documents that are identified as under NGST Project control (see Science Instruments Deliverable Items List (DIL) (NGST-LIST-000742) require that the contractor contact the NGST Project CMO (Configuration Management Officer) or NGST Project DMO (Document Management Officer) to obtain the appropriate approved documentation format. This is to insure that the documents comply with the appropriate project configuration management procedures.

3.2.3 Presentations

For presentations (e.g., project reviews), the COTR and the contractor should agree to arrangements for the materials supporting the event. Specifically, should transparencies be generated or will electronic overhead projection be provided; how many hard copies of the presentation materials should be generated; what electronic distribution list should be used; etc. Note that these presentation materials are still also considered document deliverables and in addition to being materials supporting a review, they also must be delivered to the NGST Project as specified in sections 3.2 and 3.3.

The technical reviews specified in this DRD are to be formal, electronic, technically oriented and conducted by the contractor at GSFC with a review board composed of experts appointed by the GSFC. Each review requires a review data package containing appropriate reference documentation for the review, a preliminary version of this package shall be provided to the Government 10 working days in advance of the review, unless otherwise specified in the DIL. A formal presentation shall be conducted with visuals, which summarize the review package contents. The review agenda and contents shall be mutually agreed to prior to proceeding with preparation of each review data package. At the conclusion of each review (technical and status) a report summarizing the review and listing all resulting action items shall be issued.

3.2.4 Photographs and Digital Images

For the buildup, integration and testing of flight hardware, the required format for all photo documentation will be 35mm film scanned to (Kodak or equivalent) Photo CD. A Photo CD

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

automatically stores 5 (or 6) resolutions for each image, from a "thumbnail" (192x128) size up to an 18Mb file (3072 x 2048). As a minimum, the following shall accompany the photo CD:

1. one set of index prints (automatically produced with the CD)
2. description sheet for each CD which contains the image number, date of photograph, description of each photograph

When quick-turnaround photography is necessary, digital camera images saved in "jpg" format may be used. The digital images can be stored in a designated image folder on the contractor's ftp site and the contractor shall notify the DMO that the images are available. For archival purposes, it is recommended that the images taken with a digital camera also be taken with 35mm film and scanned to photo CD.

3.2.5 Video Documentation

In cases where video documentation of flight hardware buildup and integration is required, the required format is mini-DV format video tape. The Contractor shall provide one copy of each tape, clearly labeled with date(s) and detailed description(s) of the activity. If the tape covers several sequential activities that will not fit on the label, a description sheet should accompany the tape to provide sufficient detail.

3.3 DOCUMENT REVISIONS

3.3.1 CM-Controlled Documentation

Revisions to documents that are under NGST CM control must comply with the requirements specified in the NGST Configuration Management Procedure (NGST-PROC-000654) and the Contractor’s, NGST-approved CM Procedure.

3.3.2 Library Documents

Revisions to documents that are not under NGST CM control shall be updated according to an organized identification system as outlined in the NGST Data Management Procedure (NGST-PROC-000655).

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.0 DATA ITEM DESCRIPTION

NOTE: All Document Titles for Specific Instruments shall include the instrument name (NIRCam, NIRSpec, MIRI, FGS) as a preface to or the below listed document titles.

4.1 PROGRAM MANAGEMENT

4.1.1 PM-01 Management Plan

Description: The management plan provides NASA with a description of the contractor's internal system and philosophy for managing the contract. It will describe the method in which the contractor will create, maintain and give the NGST Project access to their schedules.

SOW References: TBD

Content:

1. Project Management Strategy
2. Project Management tools
3. Technical Summary
4. Implementation approach
5. Schedules
6. Resources
7. Management Reviews
8. Controls
9. Performance Management & Assurance
10. Risk Management
11. Earned Value Management
12. WBS
13. Safety and Health

4.1.2 PM-02 Monthly and Quarterly Status Report

Description: The monthly status reports, given by the contractor, provide a regular project assessment of contract technical accomplishments, summary of program cost, schedule, and performance, as well as the status of key technical issues and near-term milestones to the NGST Project management team. These reports shall provide a summary of the activities for the month, highlight issues/problems/concerns, and briefly summarize plans for the following month for each of the level two (X.0) WBS elements. The data should be provided in presentation form. Detailed supporting technical data should only be provided on an as needed basis.

The contractor will use NGST milestone chart standards (electronic and otherwise) for any related schedule charts. In addition, any changes to the baseline schedule needs to be highlighted on these charts in a manner that shows the original baseline and the new modified baseline, with an explanation for the change.

On a quarterly basis, the Contractor will present a Status Review Package which consists of the same content as the monthly status reports as well as major engineering and programmatic issues, action item responses from previous reviews, summary of new action items, and review of risk items and mitigations.

SOW References: TBD

Content:

1. Schedule Status Reports
2. Technical Status Reports

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

3. Government Furnished Equipment Status Report
4. Risk Mitigation Status
5. Performance Assurance Status
6. Technical Budget Status (Mass, Power, Etc.)
7. Contingency Release Status including Lien List (Mass, Power, Cost, Schedule, Etc)
8. Software Build Plan Definition, Schedule and Status
9. Action Item Status
10. One Month Look-ahead
11. One page fever chart summarizing critical status of above elements

4.1.3 PM-03 Government Furnished Equipment Utilization Plan

Description: The Contractor shall develop a plan that describes the use of the government furnished equipment.

SOW Reference: TBD

Content:

The government furnished equipment plan shall identify the following information for each government furnished equipment:

1. How the equipment will be utilized in support of the NGST project
2. The schedule for the use of the equipment
3. Earliest date the equipment can be received by the contractor
4. Latest date (subsequent to scheduled delivery date in GFE List) that the equipment can be received by the contractor
5. Impact of late delivery of the equipment
6. Any back up/recovery plans that could be exercised for late delivery of the equipment

4.1.4 PM-04 Manufacturing Plan

Description: The manufacturing plan that shows how the contractor will insure that the project manufacturing needs are met.

SOW Reference: TBD

Content: The manufacturing plan shall clearly describe:

1. The methodology that will be used to manage the administration of manufacturing interfaces between the NGST Project and their internal manufacturing organization.
2. The process for preparing manufacturing related inputs to the project scheduling system
3. How the manufacturing priorities will be established
4. How work around plans will be coordinated

4.1.5 PM-05 Project Schedules

Description: Project schedules are used for planning, controlling, and specifying work activities throughout the project life cycle. The objective of Project Scheduling include:

- Ensuring that all project work is planned and sequenced properly to effectively attain established need-by dates.
- Defining activity interfaces and constraints among all project participants, including equipment suppliers and subcontractors.
- Establishing a baseline for controlling and measuring performance and providing visibility into work progress and early warning of problems.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

A hierarchy of schedules is required to permit management and control of the work effort at a level of detail commensurate with the focus of management responsibility. This hierarchy of interlocking schedule baselines includes the Master, Intermediate, and Detailed Schedules.

- Master Schedule -- The Master Schedule represents the flow-up (summarization) of the subsystem detailed data which combines key milestones, internal/external schedule dependencies, and controlled project trigger events
- Intermediate Schedules -- The Intermediate Schedules represent a summary of the detailed data contained within a Subsystem. Intermediate Schedules will be rolled-up into the Master Schedule.
- Detailed Schedules -- Detailed Schedule contains the backbone of events and activities that make-up the content of that subsystem. Detailed Schedules will be rolled-up into the Intermediate Schedules.

  Detailed network diagrams shall be developed, delivered, and maintained for each Instrument Subsystem. These networks shall reflect the significant events in sufficient detail to permit adequate monitoring of work progress. A log of all changes to the logic flow will be maintained and reported monthly for both baseline and current schedules. The monthly report shall include the current log of changes introduced during the reporting period and the current networks. Each event will contain the following data:

  - Description of event;
  - Baseline start/completion date;
  - Current expected start/completion dates (early start/early finish – late start/late finish);
  - Number of work days required to complete the task;
  - Amount of float/slack (in work days);
  - WBS element;
  - Relationship to other (internal and external) events and milestones;

  (NOTE: All events in the detailed networks are required to be no more than 20 working days in duration.)

Scheduling Tool/Process: The NGST program has standardized on an automated time phased Planning and Scheduling Software tool called Primavera Project Planner (P3) Version 3.0 to develop, maintain, and status the above Schedule hierarchy.

Schedule Control

Schedule Control provides early indications of potential problem areas and the means to reduce/minimize Schedule Risk throughout the total lifecycle of the project. Schedule control consists of data from standardized reporting mechanisms/metrics that will closely tie all items into a monthly reporting system.

SOW Reference: TBD

Content: The following status and analysis reports will be provided to the ISIM Project:

- Primavera Master Level Logic Network: A logic network summarizing the Intermediate/Detailed networks using Primavera Software
- Top Level Master Schedule: A Top Level schedule (chart) utilizing graphics software that summarizes the Intermediate Level logic networks. This schedule must be suitable for a formal presentation.
- Primavera Detailed Level Logic Network: Detailed logic networks utilizing Primavera software will be provided to the Project Office.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

- Intermediate Level Summary Chart: An Intermediate level (Summary) schedule (chart) utilizing graphics software that summarizes the detailed level logic networks. This schedule must be suitable for a formal presentation.
- Primavera Tabular Reports: Tabular reports sorted by subsystem and WBS that will reflect the same data as the detailed logic networks.
- 60 Day Window Report: A report sorted by subsystem and dates, which list all events which are expected to, start or complete within sixty days of the end of the month being reported.
- End Item Window Report: A monthly report, which reflects the float/slack for deliverable items and major milestones (items/milestones {minimum 75} {start or finish events} as determined by the NGST Project Manager). This report shall provide a comparison of the current float to the baseline and prior months float. Also supplied will be an explanatory analysis for all changes, which exceeded the established threshold (threshold is +/- 10 working days or when an item or milestone falls into another month).
- Monthly Analysis: Each monthly submittal shall begin with narrative sections for each major subsystem. Each section should address a brief description of current status and any existing or potential problems. A final section should address the overall primary critical path status as indicated by the Detailed logic networks along with any work-around techniques being implemented or proposed to maintain schedule integrity.
- Manufacturing Schedules: Manufacturing schedules and status obtained from subcontractors and vendors are not required with the monthly schedule submittal. These schedules however, will be supplied to the Project Office upon request.
- Top Ten Critical Items: On a monthly basis, the major subsystems shall submit a list of the top ten critical items or milestones to be immediately accomplished in sufficient narrative detail for the project to brief upper NGST management.

4.1.6 PM-06 Monthly Contractor Financial Management Report

Description: The monthly contractor financial management reports (533M) provide contractual expenditure data of cost incurred and estimates costs to complete. This information is necessary for the financial control and reporting required of this contract.

SOW Reference: TBD

Content: Contract Clause(s), included below for reference, will define required content and format.

NASA CONTRACTOR FINANCIAL MANAGEMENT REPORTING (1852.242-73) (JUL 2000)

(a) The Contractor shall submit NASA Contractor Financial Management Reports on NASA Forms 533 in accordance with the instructions in NASA Procedures and Guidelines (NPG) 9501.2, NASA Contractor Financial Management Reporting, and on the reverse side of the forms, as supplemented in the Schedule of this contract. The detailed reporting categories to be used, which shall correlate with technical and schedule reporting, shall be set forth in the Schedule. Contractor implementation of reporting requirements under this clause shall include NASA approval of the definitions of the content of each reporting category and give due regard to the Contractor's established financial management information system.

(b) Lower level detail used by the Contractor for its own management purposes to validate information provided to NASA shall be compatible with NASA requirements.

(c) Reports shall be submitted in the number of copies, at the time, and in the manner set forth in the Schedule or as designated in writing by the Contractor Officer. Upon completion and

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

acceptance by NASA of all contract line items, the Contracting Officer may direct the Contractor to submit Form 533 reports on a quarterly basis only, report only when changes in actual cost incur, or suspend reporting altogether.

(d) The Contractor shall ensure that its Form 533 reports include accurate subcontractor cost data, in the proper reporting categories, for the reporting period.

(e) If during the performance of this contract NASA requires a change in the information or reporting requirements specified in the Schedule, or as provided for in paragraph (a) or (c) of this clause, the Contracting Officer shall effect that change in accordance with the Changes clause of this contract.

(End of clause)

FINANCIAL MANAGEMENT REPORTING (GSFC 52.242-90)(FEB 2000)

(a) Requirements. This clause provides the supplemental instructions referred to in NASA FAR Supplement (NFS) clause 1852.242-73. The NFS clause and NASA Procedures and Guidelines (NPG) 9501.2C, "NASA Contractor Financial Management Reporting", establish report due dates and all other financial management reporting requirements. NPG 9501.2C permits withholding of payment for noncompliance.

(b) Supplemental instructions.

(1) Monthly (NF 533M) reports are required. Quarterly (NF 533Q) reports are also required. One copy shall be provided to each of the following:

Contracting Officer, Code 214.1
Contracting Officer's Technical Representative, Code 443
Deputy Project Manager for Resources, Code 443
Financial Manager, Code 443
Resources Analyst, Code 443
Administrative Contracting Officer (if delegated)

(2) The reporting structure shall report all costs at level three of the Work Breakdown Structure (for example 1.1 "Contract Management") with summaries for each higher level (for example 1 "Project Management" and total program), Attachment C of Section J of this contract. The Contractor shall segregate the formulation and implementation phases of the contract. The reports shall address the following elements:

Direct Labor Hours
- On-Site
- Off-Site

Direct Labor Workyears
- On-Site
- Off-Site

Direct Labor Cost (Calculated based on Direct Labor Hours)
- On-Site
- Off-Site

Fringe Benefit Costs
Overhead
- On-Site
- Off-Site

Other Direct Costs

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

Materials
Local Travel
Non-Local Travel
Subcontracts
Other (Specify)
Material Handling Overhead
G&A Expense
Cost of Money (if proposed)
Fee
Award Fee
Performance Incentive Fee
Total CPAF/PIF

(c) Web sites:

(1)NPG 9501.2C, "NASA Contractor Financial Management Reporting": http://nodis.hq.nasa.gov/Library/Directives/NASA-WIDE/Procedures/Financial_Management/contents.html

(2) NF 533 Tutorial: (for training purposes only) http://genesis.gsfc.nasa.gov/nf533.htm

(End of clause)

4.1.7 PM-07 Quarterly Contractor Financial Management Report

Description: The quarterly contractor financial management reports (533Q) provide contractual expenditure data of cost incurred and estimates costs to complete. This information is necessary for the financial control and reporting required of this contract and should include financial management on all subcontracts to the same level as for internal contractor efforts.

SOW Reference: TBD

Content: Contract Clause(s), see section 4.1.6, will define required content and format.

4.1.8 PM-08 Earned Value Management System Description

Description: The Earned Value Management System (EVMS) implementation procedures shall describe the implementation of the EVMS system on the NGST contract.

SOW Reference: TBD

Content: The EVMS Implementation Procedures shall clearly document the integrated project management processes for the NGST Project. These procedures shall include but not be limited to the areas of organizing work, planning, budgeting, scheduling, work authorization, cost accumulation, measurement and reporting of cost and schedule performance, materials and subcontract handling, variance analysis and baseline control. These procedures shall flow down to major subcontracts as identified.

4.1.9 PM-09 Monthly Earned Value Management System Report

Description: The Cost Performance Report (CPR) data will be used by NASA systems managers to: a) integrate cost and schedule performance data with technical performance measures, b) identify the

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

magnitude and impact of actual and potential problem areas causing significant cost and schedule variances, and c) provide valid, timely project status information to higher management.

SOW Reference: TBD

Content: Contract Clause(s), included below for reference, will define required content and format. The DD Form 2734/1 (Aug 96) shall be used in accordance with DoD Data Item Description DI-MGMT-81466.

The CPR shall provide Formats 1-5 down to WBS Level 3.

EARNED VALUE MANAGEMENT SYSTEM (1852.242-75) (MAR 1999)

(a) In the performance of this contract, the Contractor shall use:

(1) An earned value management system (EVMS) that has been recognized by the cognizant Administrative Contracting Officer (ACO) as complying with the criteria provided in NASA Policy Directive 9501.3, Earned Value Management, or DoD 5000.2-R, Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information Systems Acquisition Programs; or

(2) A company EVMS that the ACO has recognized as conforming with the full intentions of the guidelines presented in ANSI/EIA Standard 748, Industry Guidelines for Earned Value Management Systems.

(b) If, at the time of award, the Contractor's EVMS has not been recognized by the cognizant ACO per paragraph (a) of this clause or the Contractor does not have an existing cost schedule control system (C/SCS) that has been accepted by the Government, the Contractor shall apply the Contractor's EVMS to the contract and be prepared to demonstrate to the ACO that its system complies with the EVMS criteria referenced in paragraph (a) of this clause.

(c.) The Government may require integrated baseline reviews. Such reviews shall be scheduled as early as practicable and should be conducted within 180 calendar days after contract award, exercise of significant contract options, or incorporation of major contract modifications. The objective of the integrated baseline review is for the Government and the Contractor to jointly assess areas, such as the Contractor's planning, to ensure complete coverage of the statement of work, logical scheduling of the work activities, adequate resourcing, and identification of inherent risks

(d) Unless a waiver is granted by the ACO, Contractor proposed EVMS changes require approval of the ACO prior to implementation. The ACO shall advise the Contractor of the acceptability of such changes within 30 calendar days after receipt of the notice of proposed changes from the Contractor. If the advance approval requirements are waived by the ACO, the Contractor shall disclose EVMS changes to the ACO and provide an information copy to the NASA Contracting Officer at least 14 calendar days prior to the effective date of implementation.

(e) The Contractor agrees to provide access to all pertinent records and data requested by the ACO or a duly authorized representative. Access is to permit Government surveillance to ensure that the EVMS complies, and continues to comply, with the criteria referenced in paragraph (a) of this clause.

(f) The Contractor shall require the subcontractors specified below to comply with the requirements of this clause: (??Insert list of applicable subcontractors??)

(End of clause)

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.1.10 PM-10 Integrated Baseline Review Package

Description: The Integrated Baseline Review (IBR) is a review of the Performance Measurement Baseline to ensure it captures the entire technical scope, schedule requirements, and has adequate resources.

SOW Reference: TBD

Content: Contract Clause(s) will define required content and format. Contents provided for this review shall allow the NGST Project team to:

1. Identify the risks inherent in the contractor's Performance Measurement Baseline (PMB).
2. Verify the technical content of the PMB
3. Evaluate the adequacy and accuracy of the related resources (budgets) and schedules

4.1.11 PM-11 Configuration Management Plan

Description: The configuration management plan establishes the Contractor's general approach, policies, and procedures for managing configuration. It provides assurance to the NGST Project that all procured and manufactured equipment, software, and documentation vital to the development of the NGST will remain well described and accounted for even after modification, enhancement or replacement. It must be consistent with the NGST Project configuration management procedures and policies.

SOW Reference: TBD

Content:

The Contractor shall provide the appropriate information necessary to achieve the configuration management plan, including:

1.0 Introduction
2.0 Authorities and Responsibilities
3.0 Configuration Identification
4.0 Configuration Control
5.0 Configuration Status Accounting
6.0 Configuration Management Audit

4.1.12 PM-12 Document Management Plan

Description: The document management plan establishes the Contractor's general approach, policies, and procedures for data management. It provides assurance to the NGST Project that all documentation prepared for the NGST Project is in conformance with prescribed formats as outlined in Section 3.

SOW Reference: TBD

Content:

The Document Management Plan shall clearly describe the Contractor's requirements, approaches and procedures for implementing a document management program that is consistent with the NGST Data Management Procedures. The plan shall describe:

How the Contractor will establish and maintain the document center

How the Contractor will format, publish, distribute and maintain/update the documents in the document center, as a function of the type of the documentation

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

How the system will meet the rapid retrieval requirement (within one day of request)

How the documentation center will be compatible with and accessible by the NGST electronics library.

This plan shall also describe the process and schedule by which the Contractor will insure that all the documentation necessary for the efficient, long-term operation and anomaly resolution of the NGST observatory will be transitioned to the NGST project and/or the Science Operations Center.

4.1.13 PM-13 System Requirements Review

4.1.13.1 Science Instrument Review

Description: The System Requirements Review (SRR) is a technical review that demonstrates that the Contractor has fully defined the Instrument and system-level requirements for the Science Instrument. The NGST Project will approve necessary modifications to this package.

SOW Reference: TBD

Content:

The SRR agenda is planned to include, but not be limited to, the following:

1.0 System Requirements
2.0 System and subsystem conceptual architectures
3.0 Documentation
4.0 Safety
5.0 Performance Assurance
6.0 Facilities
7.0 Operational Concepts

The SRR objectives include:

a. Establish the basis for subsequent design and verification test activities by identifying formal SI and operation requirements and their pedigree.

b. Confirm that the SI-level requirements meet the mission objectives

c. Confirm that SI level specifications are sufficient to meet the project objectives.

4.1.13.2 ISIM Project and NGST Program Reviews

The ISIM Project and the NGST Program are required to have respective level SSRs. The Contractor shall provide support in preparation/presentation of the respective reviews.

4.1.14 PM-14 Preliminary Design Review

4.1.14.1 Science Instrument Review

Description: The preliminary design review (PDR) is used to demonstrate that the preliminary design of the Science Instrument meets all system requirements with acceptable risk. It demonstrates that interfaces have been properly identified and verification methods have been satisfactorily described. It also establishes the basis for proceeding with detailed design and ETU fabrication and test. The PDR will review all Instrument systems and requirements, resource allocations, verification plans, and preliminary ICDs.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

Instrument sub-system reviews, e.g., optics, mechanisms, may precede the instrument review. With ISIM Project approval, subsystem detailed design and ETU fabrication and test may commence following the respective sub-system review.

SOW Reference: TBD

Content:

The PDR agenda is planned to include, but not be limited to, the following:

1.0 Subsystem and system design
2.0 Interface Requirements Documents
3.0 Interface Control Documents
4.0 Problem areas and their resolution
5.0 Open items
6.0 Safety and health
7.0 Flight operations
8.0 Analyses and trade off studies
9.0 Preliminary test plans (environmental and functional)
10.0 Performance assurance
11.0 Packaging and production
12.0 Schedules
13.0 Configuration management/documentation
14.0 Resources
15.0 Long lead time hardware and software
16.0 Facilities
17.0 Technology readiness
18.0 Advanced development decisions
19.0 Logistics
20.0 Risk management

The PDR objectives include:

a. Ensuring that all system requirements have been allocated, the requirements are complete, and the flow down is adequate to verify system performance.

b. Showing the proposed design approach is expected the meet the functional and performance requirements and permit final design decisions to be made.

c. Showing sufficient maturity in the proposed design approach to proceed to final design.

d. Showing that the design is verifiable and that the risks have been identified, characterized, and mitigated where appropriate.

e. Identifying potential technical problems and corrective actions; dispositioning comments and recommendations; and defining action items and closeout plans.

f. Updating programmatic assessment of resources and schedule and identifying problem areas.

4.1.14.2 ISIM Project and NGST Program Reviews

The ISIM Project and the NGST Program have respective level PDRs. The Contractor shall provide support in preparation/presentation of the Science Instrument for/of these reviews.

4.1.15 PM-15 Non-Advocate Review

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

Description: *THIS IS A PROGRAM LEVEL REVIEW*.

The Non-Advocate Review (NAR) provides an independent verification of a project's plans, life cycle cost (LCC) status, and readiness to proceed to the next phase of the project's life cycle. A NAR is conducted by a team comprised of highly knowledgeable specialists from organizations outside of the advocacy chain of the project being reviewed. The Non-Advocate Review (NAR) is used to assess the state of project definition in terms of its clarity of objectives and the thoroughness of technical and management plans, technical documentation, alternatives explored, and trade studies performed. The NAR also seeks to evaluate the cost and schedule estimates, and the contingency reserve in these estimates. The Contractor shall support the preparation/presentation for the NGST ISIM Science Instrument specific portions of this review. The NGST Project will approve necessary modifications.

SOW Reference: TBD

Content:

The NAR agenda is planned to include, but not be limited to, the following:

1.0 Program/project background
2.0 Scientific and technological objectives
3.0 Formulation and implementation plans and schedules
4.0 Documentation and agreements status
5.0 Management structure and acquisition strategies
6.0 LCC estimate which includes the following
    6.1 Funding resource requirements
    6.2 Reserves allocations
    6.3 Workforce requirements
    6.4 Infrastructure requirements
    6.5 External contributions or partnering efforts
7.0 Program risk assessment and plans for mitigating risks
8.0 Technology readiness level (TRL) of all advanced technologies

The NAR objectives include:

a. Establishing the NGST Project's compatibility with NASA policy and baselined documentation.

b. Establishing the clarity of goals and objectives.

c. Establishing the thoroughness/realism of technical plans, schedules, and cost estimates (including reserves and descoping options).

d. Establishing the adequacy of management plans, including organizational structure and key personnel credentials.

e. Establishing the technical complexity, risk assessment, and risk mitigation plans.

f. Establishing that all advanced technologies have matured to TRL 6

4.1.16 PM-16 Critical Design Review

4.1.16.1 Science Instrument Review

Description: The Critical Design Review (CDR) is used to present detailed instrument system designs. It allows for the final Science Instrument requirements, resource allocations, verification plans, ICDs, and detailed designs (including simulators required to verify designs) to be presented,

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

discussed, modified (if necessary) and approved. It discloses the complete system design in full detail, ascertains that technical problems and design anomalies have been resolved, and ensures that the design maturity justifies the decision to initiate Flight Unit fabrication/manufacturing, integration and verification of mission hardware and software.

Instrument sub-system reviews, e.g., optics, mechanisms, may precede the instrument review. With ISIM Project approval, flight subsystem fabrication and test may commence following the respective sub-system review. Flight instrument integration and test shall not commence prior to the instrument CDR.

SOW Reference: TBD

Content:

The CDR agenda is planned to include, but not be limited to, the following:

1.0 Subsystem and system design
2.0 System, subsystem and component specifications
3.0 Interface Control Documents
4.0 Problem areas and their resolution
5.0 Open items
6.0 Safety
7.0 Analyses and trade off studies
8.0 Software systems
9.0 Design margins
10.0 Test plans (environmental and functional)
11.0 Performance assurance
12.0 Flight operations
13.0 Packaging and production
14.0 Schedules
15.0 Configuration management/documentation
16.0 Resources
17.0 Facilities
18.0 Technology readiness
19.0 ISIM Integration and Test Requirements
19.0 Logistics (including Transportation Plans)

The CDR objectives include:

a. Establishing the acceptability of the instrument final design so that manufacturing can be formally initiated and baseline engineering documentation defined.

b. Ensuring that the "build-to" baseline contains detailed hardware and software specifications that can meet functional and performance requirements.

c. Ensuring that the design has been satisfactorily audited by production, verification, operations, and other specialty engineering organizations.

d. Ensuring that the production processes and controls are sufficient to proceed to the fabrication stage.

e. Establishing that planned Quality Assurance (QA) activities will establish perceptive verification and screening processes for producing a quality product.

f. Verifying that the final design fulfills the specifications established at PDR.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

g. Identifying potential problems, corrective actions, and open items (including disposition of actions from PDR) for follow-up and close out by responsible parties.

4.1.16.2 ISIM Project and NGST Program Reviews

The ISIM Project and the NGST Program have respective level CDRs. The Contractor shall provide support in preparation/presentation of the Science Instrument for/of these reviews.

4.1.17 PM-17 Inputs to Mission Operations Review

Description: *THIS IS A PROGRAM LEVEL REVIEW*

The Mission Operations Review (MOR) is a technical review that covers all mission-oriented operations including instrument, spacecraft and ground systems operations. The overall design and status of the ground and flight systems shall be presented to assure that all requirements will be met. The Contractor shall support the preparation/presentation for the NGST ISIM Science Instrument specific portions of this review.

SOW Reference: TBD

Content:

The planned content of the MOR shall include the following:

Operational interfaces between the ground system and flight system (identify operational trade-offs, signal link margins, constraints, and modes of operation including safe modes)

Mission integration of pre-launch test planning (identify all planned tests between the flight segment and the ground system)

Identification of the relationship between planned ground system software releases/capabilities and planned tests with the flight segment

Identification of plans and status for flight operations team and instrument/technology operations preparations

Overall schedule and status (include documentation status for spacecraft operations concept, ground system requirements, flight operations and contingency plans and Interface Control Documents)

Mission, instrument, technology, spacecraft, flight software, and ground system overviews

Flight software maintenance approach

Flight operations team build up and training plans

Pre-launch test plans including: RF and ground system compatibility tests, data flow and end-to-end tests, simulations and exercises, launch site tests

Launch and early orbit overview including deployment activities and coverage

In-orbit checkout overview

Project database and procedure development

Spacecraft and instrument operations constraints

Spacecraft subsystem level activities

Mission planning and scheduling

On-board data memory management

Real-time operations including: health and safety monitoring, safe mode operation

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

Trend analysis plans including reports and archive

Instrument operations planning, data processing and analysis

Ground system requirements and development status

Mission readiness testing

Preliminary list of all launch-critical facilities and functions

4.1.18 PM-18 Test Readiness Review

Description: The Test Readiness Review (TRR) is used to present status of Instrument systems prior to start of testing. It is a technical review that establishes functional compliance with all technical requirements prior to exposure to environmental conditions. The TRR is a major milestone in establishing functional capabilities prior to environmental exposure and is therefore a technical baseline of functional characteristics of the system. Also, functional anomalies and their resolution will have been reviewed and formally closed out, including disposition of actions from the CDR. It also establishes approval of the formal test plans to be used for subsequent environmental testing. The NGST Project will approve necessary modifications.

SOW Reference: TBD

Content:

The TRR agenda is planned to include, but not be limited to, the following:

1.0 Test plans and procedures
2.0 Test support requirements and status
    2.1 Personnel
    2.2 Facilities
    2.3 GSE
    2.4 ASE
    2.5 Software
    2.6 Elements in database
    2.7 Instrumentation
3.0 Documentation status
4.0 Functional and environmental test history of systems and subsystems
5.0 Anomalies and their resolution
6.0 Deviations and waivers
7.0 Open items and plans for close out
8.0 Safety
9.0 Performance Assurance
10.0 Schedules

The TRR objectives include:

a. Establishing the system readiness to function during environmental exposure, and permitting the Contractor to proceed with the environmental test program.

b. Confirming that in-place test plans meet verification requirements and specifications.

c. Confirming that sufficient resources are allocated to the test effort.

d. Examining detailed test procedures for completeness and safety during test operations.

e. Determining that critical test personnel are test- and safety-certified.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

f. Confirming that test support hardware and software is adequate, pertinent and verified.

4.1.19 PM-19 Inputs to Operations Readiness Review

Description: *THIS IS A PROGRAM LEVEL REVIEW*

The Operations Readiness Review (ORR) is used to present details on the readiness for operations. It is a formal review to determine the state of readiness to support the Observatory operations functions. The ORR examines the actual system characteristics and the procedures used in its operation, and demonstrates that all flight and ground hardware, software, personnel, procedures, and user documentation reflect the deployed state of the system accurately. This review will be coordinated and worked with the NGST science operations contractor who will participate in this review. The Contractor shall be responsible for the NGST Observatory-specific portions of this review. Necessary modifications will be approved by the NGST Project.

SOW Reference: TBD

Content:

The ORR agenda is planned to include, but not be limited to, the following:

1.0 Requirements
2.0 Schedules
3.0 Budget
4.0 Operations plans and agreements
5.0 Interface Control Documents
6.0 Procedures
7.0 Flight software
8.0 Safety
9.0 Staffing and training
    9.1 Facilities
    9.2 Activation, verification and test results
    9.3 Flight operations
    9.4 Ground operations
    9.5 Logistics
    9.6 Sustaining engineering requirements
    9.7 Service and maintenance

The ORR objectives include:

a. Establishing the state of readiness of the Observatory operations and supporting flight operations and Observatory systems.

b. Establishing that the system is ready to transition into an operational mode through examination of available ground and flight test results, analyses and operational demonstrations.

c. Confirming that the system is operationally and logistically supported in a satisfactory manner considering all modes of operation and support (normal, contingency and unplanned.)

d. Establishing that operational documentation is complete and represents the system configuration and its planned modes of operation.

e. Establishing that the training function is in place and has demonstrated capability to support all aspects of system maintenance, preparation, operation, and recovery.

f. Identifying problems, corrective actions, and open items for close out by responsible parties.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.1.20 PM-20 Pre-Shipment Review

Description: The Pre-Shipment Review (PSR) is used to present status of the Instrument prior to shipment of the ISIM. It establishes readiness to ship ETU and flight hardware. The technical review will concentrate on past system performance during functional and environmental testing. Necessary modifications will be approved by the NGST Project.

SOW Reference: TBD

Content:

The PSR agenda is planned to include, but not be limited to, the following:

1.0 Test history (functional and environmental)
2.0 Interface verifications
3.0 Anomalies and corrective actions
4.0 Deviations and waivers of specification requirements
5.0 Open items and plans for close-out
6.0 Potential problems/concerns
7.0 Documentation status
8.0 Performance assurance
9.0 Spares
10.0 Safety
11.0 Shipping plans
12.0 Support requirements for Instrument shipping through launch
    12.1 Personnel
    12.2 Facilities
    12.3 Ground Support Equipment
    12.4 Software
    12.5 Elements in databases
    12.6 Instrumentation
    12.7 Resources

ISIM Project and NGST Program PSR Support

The ISIM Project and the NGST Program are required to have respective level PSRs. The Contractor shall provide support in preparation/presentation of the respective reviews.

4.1.21 PM-21 Inputs to Flight Readiness Review

Description: *THIS IS A PROGRAM LEVEL REVIEW*

The Flight Readiness Review (FRR) is used to demonstrate readiness for launch and operations. It is a formal review to assess the overall Observatory readiness to support mission objectives. The FRR examines tests, demonstrations, analyses, and audits that determine the Observatory's readiness for a safe and successful launch and for subsequent flight operations. It also ensures that all flight and ground hardware, software, personnel and procedures are operationally ready. The Contractor shall support the preparation/presentation for the NGST ISIM Science Instrument specific portions of this review. The NGST Project will approve necessary modifications.

SOW Reference: Project Reviews (requirement #1.9-j)

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

Content:

The FRR agenda is planned to include, but not be limited to, the following:

1.0 All activities at the launch site affecting Observatory tasks and the ability to proceed with pre-launch tasks.

2.0 Problems, anomalies and corrective actions

3.0 Deviations, waivers and limited life status

4.0 Red line and hold criteria for launch countdown

5.0 Launch constraints

The FRR objectives include:

a. Providing a basis for continuation of the pre-launch activities and identifying near term constraints and limitations on the decision to launch.

b. Receiving certification that flight operations can safely proceed with acceptable risk.

c. Confirming that the system and support elements are properly configured and ready for launch

d. Establishing that all interfaces are compatible and function as expected.

d. Establishing that the system state supports a launch "go" decision based on pre-defined “go/no go” criteria.

4.1.22 PM-22 Long Lead Items List

Description: The Long Lead Items List identifies all long-lead items that must be purchased or fabricated during the formulation phase of the contract.

SOW Reference: TBD

Content: The long lead item list shall:

- Identify all long lead items
- Identify the time frame, relative to the project schedule, when these items need to be ordered/ fabricated
- Identify and provide the rationale for all items that need to be purchased/ fabricated before the start of the implementation phase of the contract
- Identify the estimated cost of all identified items

4.1.23 PM-23 Risk Management Plan

Description: The Risk Management Plan documents plans to identify and mitigate risks, and to measure the effectiveness of implemented risk management strategies.

SOW Reference: TBD

Content: The risk management plan should clearly describe:

- Risk identification approach
- Risk mitigation philosophy
- Risk mitigation plan
- How this plan will interface with the NGST Project Risk management plan

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.2 SYSTEMS ASSURANCE

4.2.1 SA-01 Performance/Quality Assurance Plan

Description: The performance/quality assurance plan provides NASA with a description of how the Contractor will implement the performance and quality assurance requirements. It shall cover the areas of performance verification, safety, electrical, electronic, and electromechanical (EEE) parts controls, materials and processes control, fasteners control, reliability assurance, quality assurance, contamination control, and support to logistics tasks.

SOW Reference: TBD

Content: The Performance/Quality Assurance Plan shall contain:

1. The title, approval page, scope and the field of application;
2. Table of contents;
3. Introductory pages about the organization concerned and the manual itself;
4. The quality policy and objectives of the organization;
5. The description of the organization, responsibilities, implementation and authorities, including the organization responsible for the EEE parts, materials, reliability, safety and test requirements.
6. A description of the elements of the quality system, Contractor policy regarding each element and Contractor implementation procedures for each ANSI/ASQC Q9001-1994 element or reference(s) to approved quality system procedures; system level procedures shall address the implementation of all requirements cited in this document.
7. A definitions section, if appropriate;
8. An appendix for supportive data, if appropriate.

A controlled process shall implement Performance/Quality Assurance Plan issue and change. The Performance/Quality Assurance Plan shall be maintained/updated by the Contractor throughout the life of the contract.

4.2.2 SA-02 Contamination Control Plan

Description: The Contamination Control Plan (CCP) documents the approach to defining, controlling and monitoring the contamination of the NGST Observatory. It establishes contamination allowances and methods for controlling contamination, and therefore will contain description of the science requirements and how these lead to the resulting cleanliness requirements. The CCP will be the governing plan for contamination control throughout phases B, C/D, and E.

SOW Reference: TBD

Content:

Data on material properties, design features, test data, system tolerance of degraded performance, and methods to prevent degradation shall be provided to permit independent evaluation of contamination hazards. As a minimum, the following items shall be included in the plan for delivery:

Description of each contamination sensitive component

Mission contamination requirements and contamination budgets. Requirements will include particulate and molecular requirements for all of the hardware, including support equipment, and methods for verification of the requirements.

Overall plan for maintaining the required cleanliness levels including specialized cleaning information

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

Based on particulate and molecular analyses; plans to prevent, minimize and/or recover from contamination redistribution and accumulation throughout I&T, launch, and on-orbit

Bakeout requirements

Determine outgassing requirements as a function of time and temperature

Provide monitoring plan including (but not limited to) use of Quartz Crystal Monitors (QCMs), cold fingers, mass spectrometers

Purge requirements

Venting plan – size and location of vents with respect to contamination sensitive surface.

Plans for protection of hardware in uncontrolled environments

Plans for protection of hardware during transportation

Statements allowing for changes as necessary; significant ones with Project authority only

Overview of launch site requirements

Materials requirements

Review of materials for contamination-generating potential

Outgassing tests to determine requirements according to maximum on-orbit operating temperatures

Required environment class (per Fed-Std-209) for each phase of spacecraft and instrument development

Launch Site Requirements

Description of each area in which the hardware will be processed at the launch site

Requirements and procedures in each area for:

- Personnel
- Preparation prior to hardware arrival
- Facility cleaning and monitoring
- Hardware handling

Fairing processing requirements and procedures

List of materials and supplies needed for launch site contamination control, including details on who provides which contamination control measures: the spacecraft project, the launch site office (i.e. KSC), the launch vehicle provider, and all supporting contractor to the extent known.

On-orbit Contamination Requirements

Space environments (orbit, solar radiation, atomic oxygen, charged particles, and their synergistic effects) shall be defined

Methods to prevent and recover from contamination in orbit

Methods to evaluate on-orbit degradation

Maximum photo-polymerization of outgassing products on critical surfaces

Space debris risks and prevention

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.2.3 SA-03 Use of Previously Designed, Fabricated, or Flown Hardware

Description: This deliverable demonstrates how existing designs and/or hardware comply with current assurance and performance requirements, thereby eliminating the need to perform identified tasks otherwise required.

SOW Reference: TBD

Content:

For each identified existing design or hardware configuration considered to be in some degree of compliance with current requirements as a result of demonstrated compliance with previous requirements:

a. Compare each NGST performance, design, environmental, and interface requirement, including margins, with the corresponding previous requirement. For any mission requirement or environmental difference from the previous use, either describe the modifications to be made to the hardware and/or software to meet NGST Project requirements, or provide a rationale and supporting information demonstrating why use without modification is considered acceptable.

b. Compare each NGST performance assurance requirement with the corresponding previous requirement. Also, identify all waivers and deviations from the performance assurance requirements accepted on the previous project. For any requirement of the previous project that does not comply with the NGST requirements, or for any previous deviation or waiver, describe what will be done to achieve compliance or provide a rationale and supporting information demonstrating why the difference is acceptable.

c. Compare the manufacturing information for the hardware proposed for NGST with that of the existing hardware. This shall include, as a minimum, the name and location of the manufacturer, the date of manufacture, any design changes, any changes to parts or materials, any modification to packaging techniques, and any changes to fabrication or assembly controls or processes.

d. Describe all ground and flight experience with the proposed hardware and software including, in particular, a description of all failures or anomalies, their cause, and any corrective action that was taken as a result.

4.2.4 SA-04 Problem Failure Reports

Description: The Problem Failure Reports (PFRs) promptly report failures to the Failure Review Board (FRB) for determination of cause and corrective action.

SOW Reference: TBD

Content:

Reporting of failures shall begin with the first power application at the start of end-item acceptance testing of a major component, subsystem, or instrument (as applicable to the hardware level for which the Contractor is responsible), or the first operation of a mechanical item. Reporting of failures shall continue through formal acceptance by the Government and through post-launch operations, commensurate with Contractor presence and responsibility at GSFC and launch site operations.

All failures shall be documented on existing Contractor PFR form, which shall identify all relevant failure information.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

PFRs and updated information shall be submitted to GSFC by hard copy or made available in electronic format. PFRs submitted to the GSFC for closure include a copy of all referenced data and shall have had all corrective actions accomplished and verified.

4.2.5 SA-05 Trend Analysis

Description: The Trend Analysis monitors parameters on components and subsystems throughout the normal test program that relate to performance stability (any deviations from the nominal that could indicate trends). Operational personnel continue monitoring trends throughout the mission duration. The contractor shall define and document these parameters.

SOW Reference: TBD

Content:

Trend reports for key parameters shall be prepared in accordance with the referenced standards provided by NASA. In addition, a log of the accumulated operating time shall be kept for each component/subsystem (e.g. FPA). The log shall include the following minimum information:

1. Identification
2. Serial number
3. Operation history since first power application
    a) Operating profile
        1. Operating environment (i.e., ambient temperature, thermal vacuum, etc)
        2. Operating time at/in each environment
    b) Failure description(s)
        1. Elapsed operating time to/between failure(s)
    c) Repair and modification description(s)
4. Total operating time since last failure
5. Total additional operating time projected for the unit prior to launch

4.2.6 SA-06 Limited-Life Items

Description: The Limited-Life Items deliverable defines and tracks the selection, use and wear of limited-life items, and the impact on mission operations.

SOW Reference: TBD

Content:

List life-limited items and their impact on mission parameters. Define expected life, required life, duty cycles, and rationale for selecting and using the items. Include selected structures, thermal control surfaces, solar arrays, and electromechanical mechanisms. Atomic oxygen, solar radiation, shelf life, extreme temperatures, thermal cycling, and wear and fatigue are used to identify limited-life thermal control surfaces and structural items. When aging, wear, fatigue and lubricant degradation limit their life, include batteries, compressors, seals, bearings, valves, tape recorders, momentum wheels, gyros, actuators and scan devices. Assign responsibilities and describe managerial and reporting activities.

4.2.7 SA-07 Parts Identification List

Description: The Parts Identification List (PIL) provides a listing of all EEE parts intended for use in space flight hardware.

SOW Reference: TBD

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

Content:

The PIL shall be prepared and maintained through delivery of the NGST to the Government. The PIL shall include the following information, as a minimum:

1. Part name
2. Part number
3. Manufacturer
4. Manufacturer's generic part number
5. Procurement specification

An As-Built Parts List (ABPL) shall also be prepared and shall include the following information in addition to the above list:

1. Lot date code
2. Quantities
3. Parts use location to the sub-assembly level

Any format may be used provided the required information are included. All submissions to GSFC shall be in electronic format.

Updates to PIL shall identify changes from the previous submission.

4.2.8 SA-08 Parts Data Base

Description: The Parts Data Base (PDB) provides limit tolerances on all relevant operational parameters associated with electrical, electronic and electromagnetic (EEE) parts selected for use in the design. PDB values are required for both design and worst case circuit analysis calculations.

SOW Reference: TBD

Content:

Worst case tolerances on all EEE part parameters that are important to circuit performance shall be calculated and documented in the PDB. Factors of initial tolerance, temperature, radiation, aging, electrical stress and any other influences that can affect end-of-life parameter values shall be summed linearly to arrive at "extreme value" tolerances.

A preliminary PDB shall be prepared at the start of the detailed design effort and shall be updated as required to encompass all parts, parameters and environmental and electrical influences relevant to the final design.

The PDB shall state electrical stress derating requirements for all parts. It may also include instructions for the use of root-sum-square calculations of part tolerances for applications where worst case summations do not permit a design solution.

4.2.9 SA-09 Parts Stress Analysis

Description: The Parts Stress Analysis provides EEE parts stress analyses for evaluating circuit design and conformance with derating guidelines.

SOW Reference: TBD

Content:

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

The stress analysis report shall contain the ground rules for the analysis, references to documents and data used, a statement of the results and conclusions, and the analysis worksheets. The worksheets at a minimum shall include part identification (traceable to circuit diagrams), environmental conditions assumed, rated stress, applied stress, and ratio of applied-to-rated stress.

4.2.10 SA-10 Worst Case Circuit Analysis

Description: The Worst Case Circuit Analysis (WCCA) mathematically demonstrates the ability of the electrical design solution to meet performance requirements using end-of-life part parameter extremes in appropriate combinations to create the worst possible credible scenario.

SOW Reference: TBD

Content:

The WCCA report shall document a mathematical analysis that shows circuit performance requirements are met in the worst case using part parameter values provided by the Part Data Base (PDB). The report shall be issued on an assembly or box basis and shall include circuit operational and interface descriptions, performance attributes, worst case analysis and conclusions that show the degree of margin inherent in each identified circuit and performance attribute in the design.

WCCA documentation shall include all source material such as netlists, models and spreadsheet equations when automated tools are used for the analysis. Compliance of circuit design to requirements shall be shown in the worst case (extreme value analysis, EVA) whether or not compliance can be shown, and shall use root-sum-square or Monte Carlo analysis only when EVA compliance cannot be demonstrated.

Analog circuits shall be evaluated for gain, stability, accuracy, frequency response, drive levels, pulse characteristics, parasitic parameter compensation and/or any performance characteristics that are critical to the successful operation of the design. Digital circuits shall be analyzed for initialization, timing, race conditions, fanout, pulse characteristics, freedom from illegal states, decoupling and any other characteristics required for meeting functional requirements.

Changes made to the design subsequent to the initial WCCA shall be reflected in updates to the WCCA as required to maintain consistency between the design and the analysis.

4.2.11 SA-11 Printed Wiring Board Coupons

Description: The Printed Wiring Board (PWB) Coupons are used for independent evaluation of the quality of PWBs used in the hardware.

SOW Reference: TBD

Content:

Provide a test coupon for each PWB used in the flight hardware and note the following:

a. The coupon shall be per the design requirements of GSFC S-312-P-003, shall contain all features (e.g. vias) as the flight board, and shall only be removed from the flight PWB panel after the panel has been through all manufacturing processes.

b. The coupon shall be “as produced” by the vendor; that is, it shall not have seen any processes not experienced by the PWB panel (including metallographic preparation techniques or thermal excursions).

c. The coupon shall be clearly identified with the part number, serial number, vendor identification, and date code or production lot number.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

d. The paperwork accompanying the coupon shall include the part number, serial number, vendor identification and date code or production lot number as well as the flight experiment to which the coupon pertains and the shipper identification and tracking number.

e. A FAX shall precede the coupon receipt by one day. This FAX shall be sent to the evaluation lab, and shall include the part number, serial number, vendor identification and date code or production lot number, as well as the flight experiment to which the coupon pertains and the shipper identification and tracking number.

Two weeks prior to shipping the coupons, the hardware provider shall notify the Mission Assurance support contractor or the independent evaluation laboratory of the coupons that they plan to ship for evaluation.

Coupons shall be provided to the Government at least two weeks prior to the contractor's approval need date.

A flight PWB shall not be assembled prior to notification that the representative coupon has passed independent laboratory evaluation by the GSFC-approved laboratory.

The Systems Assurance Manager for the NGST Project shall be provided with a preliminary notification of the coupon test results and the final report.

A list of certified laboratories, their addresses and phone numbers will be provided by the GSFC Materials Engineering Branch.

4.2.12 SA-12 Materials Usage Agreement

Description: The Materials Usage Agreement provides usage evaluation and approval of non-compliant materials or lubrication usage.

SOW Reference: TBD

Content:

A Materials Usage Agreement (MUA) shall be provided for each non-compliant off-the-shelf-hardware material usage, non-compliant polymeric material outgassing, flammability or toxicity usage and non-compliant inorganic material stress corrosion cracking usage.

The MUA shall be provided on a Material Usage Agreement form, a contractor's equivalent form or the contractor's electronically transmitted form.

The MUA form requires the minimum following information: MSFC 527 material rating, usage agreement number, page number, drawing numbers, part or drawing name, assembly, material name and specification, manufacturer and trade name, use thickness, weight, exposed area, pressure, temperature, exposed media, application, rationale for safe and successful flight, originator's name, project manager's name and date.

The off-the-shelf-hardware usage information must identify the measures to be used to ensure the acceptability of the hardware such as hermetic sealing, material changes to known compliant materials, and vacuum bake-out to the error budget requirements listed in the contamination control plan.

The Contractor shall obtain MUA approval by the Government prior to use of the material.

4.2.13 SA-13 Stress Corrosion Evaluation Form

Description: The Stress Corrosion Evaluation Form provides detailed stress corrosion cracking engineering information required to demonstrate the successful flight of the material usage.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

SOW Reference: TBD

Content:

The Contractor shall provide the information requested on the stress corrosion evaluation form, the equivalent information on the Contractor's form or the equivalent information electronically.

The stress corrosion evaluation form requires, as a minimum, the following information: part number, part name next assembly number, manufacturer, material heat treatment, size and form, sustained tensile stresses, magnitude and direction, process residual stress, assembly stress, design stress, static stress, special processing, weld alloy form, temper of parent weldment metal, weld filler alloy, welding process, weld bead removal if any, post-weld thermal treatment, post-weld stress relief, environment, protective finish, function of part, effect of failure, evaluation of stress corrosion susceptibility. The Contractor shall also include information/data on material(s) stress corrosion testing that was performed.

4.2.14 SA-14 Non-conventional Material and Lubrication Report

Description: The Non-conventional Material and Lubrication Report provides for approval of a non-conventional material or lubricant usage.

SOW Reference: TBD

Content:

If a compliant material is proposed for a first time usage or application in space, or for an application with limited heritage, it is considered a non-conventional material application and a non-compliant material. For example, a beryllium instrument frame and a silicone carbide spacecraft structure are non-conventional applications. A non-conventional material application report or presentation shall contain:

a. Description of the application.
b. Thermal, stress and fracture analysis.
c. Heritage and test environment.
d. Rationale for not using a conventional material application with extensive heritage.
e. List of chemical and mechanical materials properties available and needed for design.
f. Extreme environments such high stresses, temperature, corrosive environments, and high atomic oxygen fluxes at low earth orbit.

4.2.15 SA-15 Polymeric Materials and Composites Usage List

Description: The Polymeric Materials and Composites Usage List provides for usage evaluation and approval of all polymeric and composite materials applications.

SOW Reference: TBD

Content:

The Contractor shall provide the information requested on the polymeric materials and composites usage list form, the equivalent information on the Contractor's form or the equivalent information electronically.

The polymeric materials and composites usage list (1) form requires, as a minimum, the following information: spacecraft, subsystem or instrument name, GSFC technical officer, contractor, address, prepared by, phone number, date of preparation, GSFC materials evaluator, evaluator's phone number, date received, date evaluated, item number, material identification (2), mix formula (3), cure

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

(4), amount code, expected environment (5), outgassing values and reason for selection (6). Notes 1 through 6 are listed below:

1.0 List all polymeric materials and composites applications utilized in the system except lubricants, which should be listed on polymeric and composite materials usage list.

2.0 Give the name of the material, identifying number and manufacturer.
Example: Epoxy, Epon 828, E. V. Roberts and Associates

3.0 Provide proportions and name of resin, hardener (catalyst), filler, etc.
Example: 828/V140/Silflake 135 as 5/5/38 by weight

4.0 Provide cure cycle details. Example: 8 hrs. at room temperature + 2 hrs. at 150°C

5.0 Provide the details of the environment that the material will experience as a finished S/C component, both in ground test and in space. List all materials with the same environment in a group. Example: T/V : -20°C/+60°C, 2 weeks, 10E-5 torr, ultraviolet radiation (UV). Storage: up to 1 year at room temperature. Space: -10°C/+20°C, 2 years, 150 mile altitude, UV, electron, proton, atomic oxygen.

6.0 Provide any special reason why the materials were selected. If for a particular property, please give the property. Example: Cost, availability, room temperature curing or low thermal expansion.

4.2.16 SA-16 Inorganic Materials and Composites Usage List

Description: The Inorganic Materials and Composites Usage List provides for usage evaluation and approval of all metal, ceramic and metal/ceramic composite material applications.

SOW Reference: TBD

Content:

The Contractor shall provide the information requested on the inorganic materials and composites usage list, the equivalent information on the hardware Contractor's forms or the equivalent information electronically.

The inorganic materials and composite usage list (1) form requires, as a minimum, the following information: spacecraft, subsystem or instrument name, GSFC technical officer, contractor, contractor address, prepared by, phone number, date of preparation, GSFC materials evaluator, evaluator's phone number, date received, item number, materials identification (2), condition (3), application or usage (4), expected environment (5), stress corrosion cracking table number, MUA number and NDE method. Notes 1 through 5 are listed below:

List all inorganic materials (metals, ceramics, glasses, liquids and metal/ceramic composites) except bearing and lubrication materials which should be listed on Form 18-59C.

Give materials name, identifying number manufacturer. Example:

a. Aluminum 6061-T6
b. Electroless nickel plate, Enplate Ni 410, Enthone, Inc
c. Fused silica, Corning 7940, Corning Class Works

Give details of the finished condition of the material, heat treat designation (hardness or strength), surface finish and coating, cold worked state, welding, brazing, etc. Example:

a. Heat treated to Rockwell C 60 hardness, gold electroplated, brazed.
b. Surface coated with vapor deposited aluminum and magnesium fluoride

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

c. Cold worked to full hare condition, TIG welded and electroless nickel plated.
Give details of where on the spacecraft the material will be used (component) and its function. Example: Electronics box structure in attitude control system, not hermetically sealed.

Give the details of the environment that the material will experience as a finished spacecraft component, both in ground test and in space. Exclude vibration environment. List all materials with the same environment in a group. Example:

a. T/V: -20°C/+60°C, 2 weeks, 10E-5 torr, ultraviolet radiation (UV)
b. Storage: up to 1 year at room temperature
c. Space: -10°C/+20°C, 2 years, 150 miles altitude, UV, electron, proton, atomic oxygen

4.2.17 SA-17 Lubrication Usage List

Description: The Lubrication Usage List provides for usage evaluation and approval of all lubricant usage and applications.

SOW Reference: TBD

Content:

The Contractor shall provide the information requested on the lubricant usage list, the equivalent information on the hardware Contractor's forms or the equivalent information electronically.

The lubricant usage list form requires, as the minimum, the following information: spacecraft, subsystem or instrument name, GSFC technical officer, Contractor, Contractor address, prepared by, phone number, date of preparation, GSFC materials evaluator, evaluator's phone number, date received, item number, component type, size, material (1); component manufacturer and manufacturer identification; proposed lubrication system and amount of lubrication; type and number of wear cycles (2); speed, temperature and atmosphere of operation (3); type and magnitude of loads (4) and other details (5). Notes 1 through 5 are listed below:

a. Ball bearing (BB), sleeve bearing (SB), gear (G), sliding surfaces (SS), sliding electrical contacts (SEC), Give generic identification of materials used for the component, (Examples: 440C steel, PTFE)

b. Continuous unidirectional rotation (CUR), continuous oscillation (CO), intermittent rotation (IR), intermittent oscillation (IO), small angle oscillation (< 30 degrees) (SAO), large angle oscillation (> 30 degrees) (LAO), continuous sliding (CS), intermittent sliding (IS). Number of wear cycles: 1 to 1E2 (A), 1E2 to 1E4 (B), 1E4 to 1E6 (C), >1E6 (D)

c. Speed: revolution per min. (RPM), oscillation per min. (OPM), variable speed (VS), sliding speed in centimeters per min. (CPM). Operational temperature range. Atmosphere: vacuum, air, gas sealed or unsealed and pressure

d. Type of loads: axial, radial, tangential (gear load). Give magnitude of load.

e. For ball bearings, give type and material of ball cage, number of shields, type of ball groove surface finishes. For gears, give surface treatment and hardness. For sleeve bearings, give the bore diameter and width. Provide the torque and torque margins.

4.2.18 SA-18 Material Process Utilization List

Description: The Material Process Utilization List provides for usage evaluation and approval of all material processes that are used to fabricate, clean, store, integrate and test the space flight hardware.

SOW Reference: TBD

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

Content:

The Contractor shall provide the information requested on the material process utilization list form, the equivalent Contractor's forms or the equivalent information electronically.

The material process utilization list requires, as a minimum, the following information: spacecraft, subsystem or instrument name, GSFC technical officer, contractor, address, prepared by, phone number, date of preparation, GSFC materials evaluator, evaluator's phone number, date received, date evaluated, item number, process type (1), contractor spec. number (2), Military, ASTM, Federal or other specification number, description of material processed (3) and spacecraft/instrument application (4). Notes 1 through 4 are listed below:

1.0 Give generic name of the process. Example: anodizing (sulfuric acid)

2.0 If process is proprietary, please state so.

3.0 Identify the type and condition of the material subjected to the process. Example: 6061-T6

4.0 Identify the component or structure for which the materials are being processed. Example: Antenna dish.

The Contractor shall provide a copy of the procedure qualification record (PQR) and a current copy of the operator qualification test record for all welding and brazing of all flight hardware, including repairs performed by certified operators in accordance with requirements of the appropriate industry or government standards listed in the Materials Process Utilization List , MAG Fig. 7.5

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.3 SYSTEMS ENGINERING

4.3.1 SE-01 Systems Engineering Plan

Description: The systems engineering plan shall provide NASA with a complete detailed description of the Contractor's approach to performing NGST systems engineering. It shall demonstrate a thorough understanding of Program (emphasis on the instrument) goals and objectives, coordinate the proper interaction within and among all NGST Proram, contractor, and subcontractor elements, and demonstrate a thorough understanding of technical issues and requirements.

SOW References: TBD

Content:

The plan shall contain the following information:

- Organization diagram with reporting relationships within and outside of the systems organization
- Specific internal methods, policies and procedures to be implemented
- Methods for resolving disputes
- Control of technical resources (mass, power, data storage, etc.)
- Formal review schedules and processes
- Action item tracking and control system

4.3.2 SE-02 Electromagnetic Compatibility (EMC) Control Plan

Description: The Electromagnetic Compatibility (EMC) Control Plan provides the overall approach and requirements of the EMI (Electromagnetic Interference) control program and defines the general requirements that will insure compliance of the hardware with the mission EMC requirements within the ISIM and the Observatory.

SOW Reference: TBD

Content:

The EMC Control Plan shall define the overall approach, planning, and design criteria to ensure compatible operation of the NGST Observatory. This instrument level plan shall provide the EMC requirements and management organization procedures for the instrument contractor, subcontractors, and vendors. The plan shall indicate how it relates to the ISIM hardware and the Observatory for overall EMC control. The plan shall identify the particular requirements in the design area for bonding, grounding, and shielding to control radiated and conducted emissions and susceptibility to specified EMI/EMC levels. This plan shall be traceable to GEVS and requires approval by the government.

4.3.3 SE-03 Instrument Specification

Description: The Instrument specification provides NASA with a description of the Instrument (level 4) requirements. Requirements are flowed to the, ISIM, optical telescope, and spacecraft elements.

SOW References: TBD

Content:

The Instrument specification shall contain the following information:

- Optical requirements.
- ISIM and ISIM I&T requirements
- OTE and OTE I&T requirements.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

- Spacecraft and spacecraft I&T requirements
- Observatory I&T requirements

4.3.4 SE-04 Validation and Verification Plan

Description: The Validation and Verification Plan provides NASA with a detailed description of the Contractor's approach, internal methods, policies, and procedures for implementing a comprehensive NGST requirements validation and verification program (modeling, analysis, testing) that will verify the level IV instrument requirements.

SOW References: TBD

Content:

The plan shall include details on personnel resources, financial resources, the development and execution of validation and test plans and procedures, preparation and documentation of predicted test results, preparation of validation and test summary reports, and data accumulation, reduction, and management.

4.3.5 SE-05 Inputs to ISIM/Science Instrument General Interface Requirements Document

Description: *THIS IS AN ISIM PROJECT DOCUMENT.*

The General Instrument Interface Requirements (GIRD) contains the general requirements used to define the interface of the instrument to the ISIM, OTE, and Spacecraft.

SOW Reference: TBD

Content:

This document is an ISIM Project controlled document. The Contractor shall provide the appropriate inputs for requirements for the Science Instrument to ISIM GIRD. (NOTE: This document and the associated Instrument Unique Interface Requirements Document, SE-06, will replace the draft IRD(s) which have been created for the instrument Phase-A studies.) Specific interfaces include, but are not limited to:

- Optical interfaces.
  - OTE Interfaces
  - Wave Front Sensing and Control (WFS&C).
- Mechanical/Structural interfaces.
  - Environmental interface
  - Assembly, integration and test interfaces
  - Modeling interfaces
- Thermal interfaces
  - Environmental interface
  - Assembly, integration and test interfaces
  - Modeling interfaces
- Electrical interfaces.
  - Electromagnetic interface.
  - Assembly, integration and test interfaces
  - Common Command and Data Handling (CC&DH).
- Flight software
- FPA.
- MEMS (as applicable)

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.3.6 SE-06 Inputs to ISIM/Science Instrument Unique Interface Requirements Document

Description: *THIS IS AN ISIM PROJECT DOCUMENT.*

The Unique Interface Requirements Document (UIRD) contains the unique requirements to interface the instrument to the ISIM, OTE, and Spacecraft. The document also establishes the interface requirements for accommodation of applicable NASA provided instrument components (FPA, MEMS).

NOTE: The specific Instrument Name (NIRCam, NIRSpec, MIRI, FGS) shall replace "Science Instrument" in the title of this document.

SOW Reference: TBD

Content:

This document is an ISIM Project controlled document. The Contractor shall provide the appropriate inputs for requirements to be included in the UIRD. Specific requirements will include, but not be limited to, allocations for instrument mass, volume, power, and focal plane area. Instrument specific requirements such as alignment budgets and exceptions to the GIRD (SE-05) may also be captured in the UIRD. The UIRDs will have precedence over the GIRD

4.3.7 SE-07 Inputs to ISIM/Science Instrument Interface Control Document

Description: *THIS IS AN ISIM PROJECT DOCUMENT.*

The ICD is used to define the interface with the instrument to the ISIM, OTE, and Spacecraft. The document also establishes the specific interfaces for the accommodation of NASA provided instrument components.

NOTE: The specific Instrument Name (NIRCam, NIRSpec, MIRI, FGS) shall replace "Science Instrument" in the title of this document

SOW Reference: TBD

Content:

This document will be a jointly developed, ISIM Project controlled document The Contractor shall provide the appropriate inputs for requirements for the Science Instrument to ISIM ICD. Specific interfaces include, but are not limited to:

- Optical interfaces.
  - OTE Interfaces
  - Wave Front Sensing and Control (WFS&C).
- Mechanical/Structural interfaces.
  - Environmental interface
  - Assembly, integration and test interfaces
  - Modeling interfaces
- Thermal interfaces
  - Environmental interface
  - Assembly, integration and test interfaces
  - Modeling interfaces
- Electrical interfaces.
  - Electromagnetic interface.
  - Assembly, integration and test interfaces
  - Common Command and Data Handling (CC&DH).
- Flight software.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

- FPA
- MEMS

4.3.8 SE-08 Fault Protection Requirements Document

Description: The Fault Protection Requirements Document (FPRD) provides requirements for all reliability analyses, fault tolerance requirement assessments, failure modes and effects analyses, and related or supporting engineering information necessary to ensure NGST risk containment.

SOW Reference: TBD

Content:

The FPRD shall include objectives, level of the analysis, ground rules, functional description, functional block diagrams, reliability block diagrams, bounds of equipment analyzed, reference to data sources used, identification of problem areas, single-point failures, recommended corrective action, and work sheets as appropriate for the specific analysis being performed.

A Critical Items List shall be included, containing item identification and retention rationale. Appropriate retention rationale may include design features, historical performance, acceptance testing, manufacturing product assurance, elimination of undesirable failure modes, and failure detection methods.

4.3.9 SE-09 Fault Protection Description Document

Description: The Fault Protection Description Document (FPDD) describes all reliability analyses, fault tolerance requirement assessments, failure modes and effects analyses, and related or supporting engineering information necessary to ensure NGST risk containment.

SOW Reference: TBD

Content:

The FPDD shall provide specific references necessary to implement the requirements specified in the Fault Protection Requirements Document (FPRD). The FPDD shall provide a description of the autonomous system fault protection for the Spacecraft. This document shall describe how the Spacecraft fault protection ensures the health, safety, and system integrity of the Spacecraft and the ISIM, and provides protection against loss of science data in the presence of anomalous conditions. This document shall describe the architecture of the fault protection system and the algorithms that comprise it. The document shall provide an overview of fault-protection capabilities provide by the ISIM and its Science Instruments. The document shall describe all reliability analysis, fault tolerance requirement assessments, failure modes and effects analysis, and related or supporting engineering information necessary to ensure NGST risk containment

4.3.10 SE-010 Math Models Data Package

Description: The Math Models Data Package provides the necessary description documents for the math models that represent the simulated performance of the Instrument.

SOW References: TBD

Content:

This package shall consist of data files and description documents that properly represent the simulated performance of the Science Instrument, and provides the basis of traceability needed to all upper level element and component math models for purposes of pre-flight performance estimates

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

and design verification, as well as post-flight assessments. All math models used to design the Instrument (optical, mechanical/structural, thermal) shall be included.

The Instrument IRD delineates the required math models (optical, mechanical/structural, thermal) and formats for submission.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

4.4 INTEGRATION AND TEST

4.4.1 IT-01 Integration and Test Plan

Description: The I&T Plan provides a detailed description of how the Contractor will execute, in a cost-effective manner, the overall I&T activity to integrate the Instrument and validate that the Instrument conforms to the requisite performance specifications, including environmental exposures (EMC, thermal vacuum, thermal balance, vibro-acoustic, shock, etc.).

SOW References: TBD

Content:

The content shall include:

- Test objectives
- Roles and responsibilities of the members of the I&T team
- Test requirements, including requirements definition and management, data reduction/analysis and management, reporting of discrepancies, and rework and retest provisions
- Security, safety, and precautionary provisions to safeguard the Instrument and personnel
- Facility cleanliness and contamination control provisions
- Instrument integration flow/description, with facilities, GSE, configurations, and list of procedures
- Test equipment requirements, and facilities including descriptions with capabilities
- Test program description, including test sequence, objectives of each test, preparations required, facilities, GSE, configurations, and list of procedures
- Facility planning and modification plans
- Listing(s) and Data Base(s) for all automated I&T testing for use/modification at ISIM and Observatory level I&T

4.4.2 IT-02 Validation Reports

Description: The Validation Reports summarize compliance with system specification requirements and/or provide a summary of testing and analysis results, including conformance, nonconformance, and trend data.

SOW Reference: TBD

Content:

The content shall include:

- Validation Report: Provide after each unit/component, subsystem/instrument, and payload validation activity. For each analysis activity the validation report shall describe the degree to which the objectives were accomplished, how well the mathematical model was validated by the test data, and other significant results.
- System Performance Validation Report: Compare hardware/software specifications with the verified values (whether measured or computed). This validation report shall be subdivided by subsystem/instrument.

4.4.3 IT-03 Instrument and Ground Support Equipment Transportation Plan

Description: The Science Instrument and GSE Transportation Plan defines the preparations, operations support, and scheduling required to safely transport the Science Instrument and associated

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

GSE from the Contractor's facility to the ISIM I&T facility. Included are both ground and air transportation as required.

The plan also defines any Science Instrument specific operations support required to safely transport the Science Instrument and associated GSE from the ISIM I&T facility to the NGST Observatory I&T facility and the launch site, and for return of the GSE following launch.

SOW Reference: TBD

Content:

The content shall include:

- List of preparations and descriptions with process flow for all activities necessary prior to shipment
- Roles and responsibilities of the members of the transportation team
- Details of GSE transportation to ISIM I&T, Observatory I&T, and the launch site, including list of items to be transported, applicable procedures, inventory control provisions, documentation required, and modes of transportation
- Details of Instrument transportation to the ISIM I&T facility, Observatory I&T, and launch site, including support equipment to be transported, applicable procedures, contamination controls, safety provisions, facilities required, and modes of transportation
- Details of GSE transportation return from launch site, including, applicable procedures, documentation required, and modes of transportation

4.4.4 IT-04 Inputs to ISIM Integration and Test Plan

Description: *THIS IS AN ISIM PROJECT DOCUMENT*

The ISIM I&T Plan provides a detailed description of how the ISIM Project will execute the overall I&T activity to integrate the Science Instrument complement to the ISIM structure and validate that the ISIM conforms to the requisite performance specifications, including environmental exposures (EMC, thermal vacuum, thermal balance, vibro-acoustic, shock, etc.).

SOW References: TBD

Content: The Instrument Contractor shall provide inputs/support with the ISIM Project for this document.

The content shall include:

- Test objectives
- Roles and responsibilities of the members of the I&T team
- Test requirements, including requirements definition and management, data reduction/analysis and management, reporting of discrepancies, and rework and retest provisions
- Security, safety, and precautionary provisions to safeguard the Instrument and personnel
- Facility cleanliness and contamination control provisions
- Instrument integration flow/description, with facilities, GSE, configurations, and list of procedures
- Test equipment requirements, and facilities including descriptions with capabilities
- Test program description, including test sequence, objectives of each test, preparations required, facilities, GSE, configurations, and list of procedures

Facility planning and modification plans

4.4.5 IT-05 Ground Support Equipment Description and User's Guide

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

Description: The Ground Support Equipment Description and User's Guide provides a detailed description of the SI-provided GSE. The document also provides instructions on the use of the GSE during ISIM and Observatory level I&T.

SOW References: TBD

Content: The document shall contain sections for each mechanical, optical, and electrical GSE item provided by the Instrument Contractor for use during ISIM and Observatory level I&T.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

4.5 OBSERVATORY OPTICAL TELESCOPE ELEMENT

4.5.1 OTE-01 Inputs to OTE Simulator to ISIM Interface Requirements Document

Description: *THIS IS AN OBSERVATORY PRIME CONTRACTOR DOCUMENT* (Observatory Prime Contract Document OTE-21.)

The OTE Simulator to ISIM Interface Requirements Document provides the IRD containing level III requirements that describe the OTE Simulator to ISIM interface. The Instrument Contractor shall provide inputs/support with the ISIM Project for this document.

SOW Reference: TBD

Content:

Specific interfaces include:

- Electrical interfaces.
- Common Command and Data Handling (CC&DH).
- Pointing and control.
- Wave Front Sensing and Control (WFS&C).
- Electromagnetic interface.
- Flight software.
- Integration and test interfaces.
- Performance assurance.

4.5.2 OTE-02 Inputs to OTE Simulator to ISIM Interface Control Document

Description: *THIS IS AN OBSERVATORY PRIME CONTRACTOR DOCUMENT.* (Observatory Prime Contract Document OTE-22.)

The OTE Simulator to ISIM Interface Control Document provides the ICD containing level III requirements that describe the OTE Simulator to ISIM interface. The Instrument Contractor shall provide inputs/support with the ISIM Project for this document.

SOW Reference: TBD

Content:

Specific interfaces include:

- Electrical interfaces.
- Common Command and Data Handling (CC&DH).
- Pointing and control.
- Wave Front Sensing and Control (WFS&C).
- Electromagnetic interface.
- Flight software.
- Integration and test interfaces.
- Performance assurance.

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.6 SCIENCE INSTRUMENT

4.6.1 SI-01 Preliminary Design Description Document

Description: The Preliminary Design Description Document provides the detail/supporting data for the preliminary design review (PDR) [PM-14] presentation. The data shall demonstrate that the preliminary design of the Science Instrument meets all system requirements with acceptable risk. It demonstrates that interfaces have been properly identified and verification methods have been satisfactorily described. It also establishes the basis for proceeding with detailed design and Engineering Unit fabrication and test. The document shall include information on all Instrument systems and requirements, resource allocations, verification plans, and preliminary ICDs. The NGST Project will approve necessary modifications.

SOW Reference: TBD

Content: see PM-14

4.6.2 SI-02 Design Description Document

Description: The Design Description Document provides the detail/supporting data for the Instrument critical design review (CDR) [PM-16] presentation. The data shall demonstrate that the design of the Science Instrument meets all system requirements with acceptable risk. It demonstrates that interfaces have been properly identified and verification methods have been satisfactorily described. It also establishes the basis for proceeding with Flight Instrument fabrication and test. The document shall include information on all Instrument systems and requirements, resource allocations, verification plans, and final ICDs. The NGST Project will approve necessary modifications.

SOW Reference: TBD

Content: see PM-16

4.6.3 SI-03 Mass and Thermal Simulator for the Optics Assembly Report

Description: The Mass and Thermal Structure (MTS) for the Optics Assembly (MTSOA) Report documents the design and results of all tests performed during the MTSOA fabrication and test.

SOW Reference: TBD

Content:

This report shall contain the following information:

- Design description
- Test Data
  - "As performed" procedures with redlined changes
  - Raw test data
  - Deviations/non-conformances with dispositions
  - Summary of results

4.6.4 SI-04 Instrument Control Electronics Simulator Report

Description: The Instrument Control Electronics Simulator (ICES) Report documents the design, results of all tests performed during the ICES fabrication and test, and operation of the ICES.

SOW Reference: TBD

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

Content:

This report shall contain the following information:

- Design Description
- Test Data
  - "As performed" procedures with redlined changes
  - Raw test data
  - Deviations/non-conformances with dispositions
  - Summary of results
- ICES Operations

4.6.5 SI-05 Structural-Thermal Model Report

Description: The Structural-Thermal Model (STM) Report documents the results of all tests performed during the Structural-Thermal Model (STM) Instrument Fabrication and Test.

SOW Reference: TBD

Content:

This report shall contain the following information:

- "As performed" procedures with redlined changes
- Raw test data
- Deviations/non-conformances with dispositions
- Summary of results

4.6.6 SI-06 Engineering Test Unit Report

Description: The Engineering Test Unit Report documents the results of all tests performed during the Engineering Test Unit Instrument Integration and Test phase.

SOW Reference: TBD

Content:

This report shall contain the following information:

- "As performed" procedures with redlined changes
- Raw test data
- Deviations/non-conformances with dispositions
- Characterization/calibration data
- Summary of results

4.6.7 SI-07 Flight Unit Report

Description: The Flight Unit Report documents the results of all tests performed during the Flight Unit Instrument Integration and Test phase.

SOW Reference: TBD

Content:

This report shall contain the following information:

- "As performed" procedures with redlined changes
- Raw test data

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

- Deviations/non-conformances with dispositions
- Characterization/calibration data
- Summary of results

4.6.8 SI-08 Acceptance Data Package

Description: The Acceptance Data Package is required prior to submittal of each system release for GSFC acceptance. The Acceptance Data Package shall be used to identify the contents, configuration and status of the delivery.

SOW Reference: TBD

Content:

An Acceptance Data Package is required with the ETU and Flight instrument deliveries. The Acceptance Data Package shall include the following information with appropriate approvals:

1. As-built configuration List
2. List of parts used
3. List of materials and processes used
4. Test log book including total operating time and cycle records
5. List of open items (i.e., nonconformances, etc) with reasons for items being open and appropriate authorization/approvals
6. Listing and status of all identified limited-life items
7. Trend data
8. Test results
9. Problem/failure reports

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.7 GROUND SOFTWARE

4.7.1 GS-01 Ground Software Report

Description: The Ground Software Report documents the requirements, design, algorithms, code, testing and use of software developed for the Science Instrument ground tests and calibration, including software prepared for off-line data analysis.

The algorithms and code delivered in this document will serve as inputs to the calibration and data analysis software to be developed by the NGST Science and Operations Center.

SOW Reference: TBD

Content:

This report shall contain the following information:

- A description of the functional, performance and interface(s) requirements of the software
- Description of the design of the software and how it meets the requirements
- A User/operating manual that provides sufficient and necessary information for the user to exercise all options of the software and all instructions and procedures to initialize, run, and terminate the software system
- A description of all anomalous conditions, remedies, and a decision tree of diagnostic and verification capabilities for troubleshooting and maintenance
- A complete software listing in electronic form, including source and object code, any associated databases, and test data sets
- Test cases, test procedures, test results, discrepancy reports and a record of validation and verification activities

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

4.8 FLIGHT SOFTWARE

The documents, software, and data products to be delivered for the flight software components are tailored from and consistent with the Rational Unified Process (RUP). To promote uniformity of SI flight software products and predictability of the development and integration processes, the SI software development will be performed using the Rational Rose RealTime tool. Others tools from the Rational Rose tool suite will be used, as appropriate.

4.8.1 FSW-01 FSW Product Plan

Description: The Software Product Plan describes the management and technical approaches that govern the software development processes. It also describes what products and materials are received and delivered, how requirements are determined, and important aspects of the provider's relationship with the customer.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Product Plan:

- 1.0 Introduction
- 2.0 Related Documentation
- 2.0 Customer Agreement
  - 2.1 Requirements Sources
  - 2.2 Resources Required
  - 2.3 Receivables and Deliverables
  - 2.4 FSW Team Placement within Customer Organization
  - 2.5 Acceptance Criteria
  - 2.6 Customer Training
  - 2.7 Medium for Product Delivery
  - 2.8 Product Destination
  - 2.9 Post Delivery Maintenance
- 3.0 Management Approach
  - 3.1 General Development Approach
  - 3.2 Staffing Profile
  - 3.3 Team Organization
  - 3.4 Development Facilities
  - 3.5 Procurement
  - 3.6 Team Training Plan
  - 3.7 Risk Mitigation
  - 3.8 Schedules
  - 3.9 List of Controlled Documentation
  - 3.10 Process & Product Metric Analysis
- 4.0 Technical Approach
  - 4.1 Software Overview
  - 4.2 Software Development Plan
    - 4.2.1 Development Approach
      - 4.2.1.1 Life-cycle Phases
      - 4.2.1.2 Phases and associated products
    - 4.2.2 Development Methodology
    - 4.2.3 Development Tools
    - 4.2.4 Programming Languages

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

4.3 Process for Transportation, Identification, and Medium of Product
4.4 FSW Maintenance
5.0 Product Assurance
5.1 Assumptions and Constraints
5.2 Quality Assurance
5.2.1 Applicable Standards
5.2.2 Approach and Activities
5.2.3 Methods and Techniques
5.3 Configuration Management
5.3.1 Configuration Management Process Overview
5.3.2 Configuration Control Activities
5.3.2.1 Configuration Identification
5.3.2.2 Configuration Change Control
5.3.2.2.1 Controlled Storage and Release Management
5.3.2.2.2 Change Control Flow
5.3.2.2.3 Change Documentation
5.3.2.2.4 Change Review Process
5.3.2.3 Configuration Status Accounting
5.3.2.4 Configuration Authentication
6.0 Acronyms and Abbreviations
7.0 Appendices
A. Risk List
B. Schedule
C. Glossary

4.8.2 FSW-02 FSW Vision Document

Description: The Software Vision Document defines the stakeholders' view of the product to be developed, specified in terms of the stakeholders' key needs and features. Containing an outline of the envisioned core requirements, it provides the basis for the more detailed technical requirements.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Vision Document:

1.0 Introduction
1.1 Purpose
1.2 Scope
1.3 Definitions, Acronyms and Abbreviations
1.4 References
1.5 Overview
2.0 Positioning
2.1 Business Opportunity
2.2 Problem Statement
2.3 Product Position Statement
3.0 Stakeholder and User Descriptions
3.1 Market Demographics
3.2 Stakeholder Summary
3.3 User Summary
3.4 User environment
3.5 Stakeholder Profiles
3.5.1 <Stakeholder Name>

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

3.6 User Profiles
3.6.1 <User Name>
3.7 Key Stakeholder / User Needs
4.0 Product Overview
4.1 Product Perspective
4.2 Summary of Capabilities
4.3 Assumptions and Dependencies
4.4 Cost and Pricing
4.5 Licensing and Installation
5.0 Product Features
6.0 Constraints
7.0 Quality Ranges
8.0 Precedence and Priority
9.0 Other Product Requirements
9.1 Applicable Standards
9.2 System Requirements
9.3 Performance Requirements
9.4 Environmental Requirements
10.0 Documentation Requirements
10.1 User Manual
10.2 Online Help
10.3 Installation Guides, Configuration, Read Me File
10.4 Labeling and Packaging
11.0 Appendix 1 - Feature Attributes
11.1 Status
11.2 Benefit
11.3 Effort
11.4 Risk
11.5 Stability
11.6 Target Release
11.7 Assigned To
11.8 Reason

4.8.3 FSW-03 FSW Requirements Specification

Description: The Software Requirements Specification (SRS) captures the complete software requirements for the system, or a portion of the system. When using use-case modeling, this artifact consists of a package containing use cases of the use-case model and applicable Supplementary Specifications.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Requirements Specification:

1.0 Introduction
1.1 Purpose
1.2 Scope
1.3 Definitions, Acronyms and Abbreviations
1.4 References
1.5 Overview
2.0 Overall Description
3.0 Specific Requirements

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

3.1 Functionality
3.1.1 <Functional Requirement One>
3.2 Usability
3.2.1 <Usability Requirement One>
3.3 Reliability
3.3.1 <Reliability Requirement One>
3.4 Performance
3.4.1 <Performance Requirement One>
3.5 Supportability
3.5.1 <Supportability Requirement One>
3.6 Design Constraints
3.6.1 <Design Constraint One>
3.7 Online User Documentation and Help System Requirements
3.8 Purchased Components
3.9 Interfaces
3.9.1 User Interfaces
3.9.2 Hardware Interfaces
3.9.3 Software Interfaces
3.9.4 Communications Interfaces
3.10 Licensing Requirements
3.11 Legal, Copyright and Other Notices
3.12 Applicable Standards
4.0 Supporting Information

4.8.4 FSW-04 FSW Iteration Plan

Description: The Iteration Plan defines at a high-level the sequence of iterations that will constitute the development process showing the general allocation of features to the entire sequence of iterations. Additionally, it provides a more detailed plan for the current iteration, consisting of:

- a detailed work breakdown structure of the activity and responsibility assignments
- intra-iteration milestones and deliverables
- evaluation criteria for the iteration

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Iteration Plan:

1.0 Introduction
1.1 Purpose
1.2 Scope
1.3 Definitions, Acronyms and Abbreviations
1.4 References
1.5 Overview
2.0 Overview of Planned Iterations
3.0 Detailed Plan for Current Iteration
3.0 Resources
4.0 Use Cases
5.0 Evaluation Criteria

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

4.8.5 FSW-05 FSW Architecture Document

Description: The Software Architectural Detailed Design Document records the logical/functional design information for the Science Instrument C&DH components and the Instrument Control flight software. This includes design rationale and trades, the selected architecture of the software including at least one level of decomposition, the relationships and interface description between the levels, and the relation of the software requirements to the ISIM C&DH and Instrument Control flight software.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Architecture Document:

1.0 Introduction
- 1.1 Purpose
- 1.2 Scope
- 1.3 Definitions, Acronyms and Abbreviations
- 1.4 References
- 1.5 Overview

2.0 Architectural Representation
3.0 Architectural Goals and Constraints
4.0 Use-Case View
- 4.1 Use-Case Realizations

5.0 Logical View
- 5.1 Overview
- 5.2 Architecturally Significant Design Packages

6.0 Process View
7.0 Deployment View
8.0 Implementation View
- 8.1 Overview
- 8.2 Layers

9.0 Data View (optional)
10.0 Size and Performance
11.0 Quality

4.8.6 FSW-06 Inputs to Science Instrument to ISIM FSW Interface Control Document

Description: *THIS IS AN ISIM PROJECT DOCUMENT*

The Science Instrument to ISIM FSW Interface Control Document (ICD) defines the formats for data exchanged between ISIM flight software and the Science Instrument applications. The Contractor shall provide inputs and shall participate in preparation and upkeep of this document.

NOTE: The specific Instrument Name (NIRCam, NIRSpec, MIRI, FGS) shall replace “Science Instrument” in the title of this document

SOW Reference: TBD

Content:

The contents of the Science Instrument to ISIM FSW Interface Control Document (ICD) will include the following:

1.0 Introduction
2.0 Related Documentation
3.0 Interface Descriptions

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.0 Interface Specifications
5.0 Abbreviations and Acronyms
6.0 Glossary
7.0 Notes
8.0 Appendices

4.8.7 FSW-07 FSW Test Plan

Description: The test plan describes the purpose and goals of testing, and identifies the strategies to be used to implement and execute testing, and the resources needed.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Test Plan:

1.0 Introduction
- 1.1 Purpose
- 1.2 Background
- 1.3 Scope
- 1.4 Project Identification

2.0 Requirements for Test
3.0 Test Strategy
- 3.1 Testing Types
  - 3.1.1 Data and Database Integrity Testing
  - 3.1.2 Function Testing
  - 3.1.3 Business Cycle Testing
  - 3.1.4 User Interface Testing
  - 3.1.5 Performance Profiling
  - 3.1.6 Load Testing
  - 3.1.7 Stress Testing
  - 3.1.8 Volume Testing
  - 3.1.9 Security and Access Control Testing
  - 3.1.10 Failover and Recovery Testing
  - 3.1.11 Configuration Testing
  - 3.1.12 Installation Testing
- 3.2 Tools

4.0 Resources
- 4.1 Workers
- 4.2 System

5.0 Project Milestones
6.0 Deliverables
- 6.1 Test Model
- 6.2 Test Logs
- 6.3 Defect Reports

7.0 Appendix A: Project Tasks

4.8.8 FSW-08 FSW Test Evaluation Summary

Description: The Test Evaluation Summary collects, organizes and presents the test results for objective evaluation, review and assessment. In addition, the Test Evaluation Summary contains an evaluation, by the testers and test designers, of this information and recommendations for future efforts.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Test Evaluation Summary:

1.0 Introduction
- 1.1 Purpose
- 1.2 Scope
- 1.3 Definitions, Acronyms and Abbreviations
- 1.4 References
- 1.5 Overview

2.0 Test Results Summary
3.0 Test Coverage
4.0 Code Coverage
5.0 Suggested Actions
6.0 Diagrams

4.8.9 FSW-09 FSW Integration Build Plan

Description: The Integration Build Plan defines the order in which the components and subsystems should be implemented, which builds to create when integrating the system, and how they are to be assessed. The integration build plan provides a detailed plan for integration within an iteration.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instruments Software Integration Build Plan:

1. Introduction
   - 1.1 Purpose
   - 1.2 Scope
   - 1.3 Definitions, Acronyms and Abbreviations
   - 1.4 References
   - 1.5 Overview
2. Subsystems
3. Builds

4.8.10 FSW-10 FSW Deployment Plan

Description: The Deployment Plan describes the set of tasks necessary to install and test the developed product such that it can be effectively transitioned to the user community. The Deployment Plan provides a detailed schedule of events, persons responsible, and event dependencies required to ensure successful cutover to the new system.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instruments FSW Deployment Plan:

1. Introduction
   - 1.1 Purpose
   - 1.2 Scope
   - 1.3 Overview
   - 1.4 Definitions, Acronyms and Abbreviations
2. References

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

3. Deployment Planning
    3.1 Responsibilities
    3.2 Schedule
        3.2.1 Deployment Planning
        3.2.2 Support Material Development
        3.2.3 Acceptance Test Management
        3.2.4 Producing the Deployment Unit
        3.2.5 Beta Program Management
        3.2.6 Manage Product Mass Production and Packaging
        3.2.7 Making the Product Accessible over the Internet
4. Resources
    4.1 Facilities
    4.2 Hardware
    4.3 The Deployment Unit
        4.3.1 Support Software
        4.3.2 Support Documentation
        4.3.3 Support Personnel
5. Training

4.8.11 FSW-11 FSW Requirements Review Package

Description: The FSW Review Package shall cover, at a high level, the same material provided in the outlined requirements document submitted under the Science Instruments software requirements.

SOW Reference: TBD

Content:

The Contractor shall address the following topics in the Science Instruments FSW Requirements Review Package:

1.0 Relevant Mission Characteristics
2.0 Operations Concept Overview
3.0 Functional Requirements
4.0 Interface Requirements
5.0 Quality of Service Requirements
    5.1 Performance
    5.2 Supportability
    5.3 Design Constraints
    5.4 Usability
    5.5 Reliability
6.0 FSW Qualification Requirements
7.0 FSW Re-use Strategy
8.0 Requirements Control Approach
9.0 Staffing, Build Process, and Schedule
10.0 Issues, Risks, TBDs, Actions

4.8.12 FSW-12 FSW Architecture Review Package

Description: The Flight Architectural Review Package shall cover, at a high level, the same material provided in the Science Instrument flight software architectural design document. The primary purpose of the ADR is to ensure that the basic software design will meet the software requirements. Also, the design should show that external interfaces have been resolved, and that FSW internal

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

interfaces have also been resolved. The preliminary design must be documented for Science Instrument Control flight software. This includes the relationships and interface description between the levels, and the relation of the software requirements to the ISIM C&DH and flight software.

SOW Reference: TBD

Content:

The Contractor shall address the following topics in the Science Instrument Flight FSW Architecture Review Package:

1.0 Introduction
2.0 FSW Architectural Design
    2.1 Hardware Interface/Introduction
    2.2 FSW Overview – Include software context diagram
    2.3 Task Design Overview – List and describe tasks and timing (in order of priority)
    2.4 Task Preliminary Design
3.0 FSW ISIM Interface
    3.1 Interface definition
    3.2 Command message format
    3.3 Command Summary – list cmd #, command description
    3.4 Event Status – describe how diagnostic information will be implemented
    3.5 Data Loading (Table loads, Block loads)
    3.6 Database Definitions – describe changes to database to support FSW
    3.7 Commanding (Stored commands, Formats)
4.0 Operations – Describe impacts to operations for both testing and operations
5.0 FSW Development Approach – Describe the development process:
6.0 Test Facilities & Simulation Requirements
7.0 FSW Qualification Process
    7.1 Test Plan Status
    7.2 Testing Objectives
    7.3 Verification Methods (inspection, analysis, tools, etc.)
    7.4 Test Strategy
    7.5 Build Tests, System Tests, Acceptance Tests
8.0 Documentation
9.0 Estimates/Metrics
10.0 Status and Schedules
11.0 Issues, Risks/Risk Mitigation Strategies, TBDs
12.0 Actions

4.8.13 FSW-13 FSW Delivery Package

Description: Software products from SI software build activities are delivered to the ISIM flight software team for integration with the latest version of the ISIM C&DH. With each delivery, a Software Delivery Package shall be provided consisting of electronic media and a Release Notes Document, and a regression test package.

SOW Reference: TBD

Content: The Contractor shall provide the following items in the Science Instrument FSW Delivery Package:

Release Notes Document

1.0 Introduction

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

2.0 Related Documentation
3.0 Product Description
- 3.1 Product Features
- 3.1 Installed Changes
- 3.2 Waivers
- 3.3 Possible Problems and Known Errors
- 3.4 Bill of Materials

4.0 Installation Instructions
5.0 Regression Test Procedures
5.0 Abbreviations and Acronyms
6.0 Glossary
7.0 Notes
8.0 Appendices

Electronic Media: CDROM or Zip Disks (TBD) containing design models, data models, implementation models and test models consistent with the Bill of Materials, and including regression test procedures, data and results. Note, the above-mentioned models are the Rational Rose equivalents of source files, make files, procedures, and data files in a conventional software development process.

4.8.14 FSW-14 FSW Users Guide

Description: The User's Guide provides the end user with instructions explaining how to use the SI flight software effectively.

SOW Reference: TBD

Content:

1.0 Introduction
2.0 Related Documentation
3.0 Overview of Purpose and Functions
4.0 Installation and Initialization
5.0 Startup and Termination
6.0 Functions and their Operation
7.0 Error and Warning Indications
8.0 Recovery Procedures
9.0 Abbreviations and Acronyms
10.0 Glossary
11.0 Notes
12.0 Appendices

4.8.15 FSW-15 FSW Data Base Document

Description: The Data Base Document describes the data base elements needed to operate the science instrument through the software. These include definitions for commands, telemetry points, real-time sequences for anomaly response, and loadable data structures.

SOW Reference: TBD

Content: The Contractor shall address the following topics in the Science Instrument FSW Data Base Document:

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

4.9 OPERATIONS

4.9.1 OPS-01 Commissioning Plan

Description: The Commissioning Plan documents the Contractor's specific plans for the early phases of the Science Instrument on-orbit activation and evaluation. The plan describes how the activities and analyses necessary to assure the viability of the instrument, assess the performance of the instrument, and initiate science operations should be implemented. The plan shall include I&T activities needed to demonstrate readiness for launch and instrument commissioning.

SOW Reference: TBD

Content: TBD

4.9.2 OPS-02 Orbital Verification Flow

Description: The Orbital Verification Flow documents the nominal sequence and interrelationships of the flight activities comprising the operations plan from initial instrument activation through completion of instrument/Observatory commissioning.

SOW Reference: TBD

Content:

4.9.3 OPS-03 Command Document

Description: The Command Document (SICD) will provide inputs to the NGST Observatory Command Document (OCD) to define the content of the commanding and procedures needed to configure and control the Science Instrument during each mission phase. The SICD will be used by the NGST SOC and the NGST Program to develop the Operations Plan, operational procedures and command sequences.

SOW Reference: TBD

Content: The Command Document shall "mirror" the NGST OCD content as applicable. The NGST OCD content requirements are described below.

The NGST OCD shall follow the requirements and interfaces defined in the Flight to Ground IRD and ICD.

The OCD shall distinguish the command data specifications for Bypass Commands and Software Commands. Individual command definition shall include the data type, data length, parameter length and definition, illegal state constraints, scaling and special action identification, and verification methods. Integer signed and unsigned 8, 16 and 32 bit parameter values and floating point IEEE 32 or 64 bit parameter values are supported by flight software.

The OCD shall also describe high-level command sequences and OPE directives used to invoke execution of defined flight sequences.

The NGST OCD shall include the following:

1.0 Introduction
- 1.1 Purpose and Scope
- 1.2 Mission Overview
- 1.3 Document Overview
- 1.4 Context/Assumptions
- 1.5 Applicable Documents
  - 1.5.1 Government Documents

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

4.9.4 OPS-04 Reference Data Description Document

Description: The Reference Data Description Document will provide inputs to the NGST Reference Data Description Document (RDDD). The RDDD describes the commands, procedures, calibration, algorithms and reference data necessary to control and configure the Observatory or trend Observatory performance.

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

SOW Reference: TBD

Content: The Reference Data Description Document shall "mirror" the NGST RDDD content as applicable. The NGST RDDD content requirements are described below.

The NGST RDDD shall follow the requirements and interfaces defined in the Flight to Ground IRD and ICD.

The document shall contain the data range and calibration tables for each command. It shall provide a format description, mnemonic, type, function, bit configuration, subsystem, and criticality indicator for each command.

The NGST RDDD shall include the following:

1.0 Introduction
- 1.1 Purpose and Scope
- 1.2 Mission Overview
- 1.3 Document Overview
- 1.4 Context/Assumptions
- 1.5 Applicable Documents
  - 1.5.1 Government Documents
  - 1.5.2 Non-Government Documents
- 1.6 Updates and Revisions

2.0 Observatory Command List
- 2.1 Spacecraft
- 2.2 SSM
- 2.3 ISIM
- 2.4 OTE
- 2.5 Sunshield
- 2.6 Instrument

3.0 OPE Directives
4.0 Command Sequences
Appendices
Abbreviations and Acronyms
References
List of Tables
List of Figures

4.9.5 OPS-05 Inputs to Description and Operations Handbook

Description: It is planned that an Operations Working Group will be established, with representation from the science and engineering staff of each instrument team (NIRCam, NIRSpec, MIRI), to develop a detailed description of how each instrument will be operated. This working group will develop an operations and management plan for each instrument. This plan will be used as a basis of estimate for operations costs, and to define engineering requirements. : This plan will contain a complete walk-through of science operations for each instrument, detailed requirements for all operational modes, and operational requirements for each mechanism

SOW Reference: TBD

Content: TBD

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.9.6 OPS-06 Constraints and Restrictions Document

Description: The instrument Constraints and Restrictions Document (CARD) provides the results of Contractor analyses of the instrument and identifies prohibited configurations and operations which will or might result in hardware damage.

SOW Reference: TBD

Content: The instrument CARD will "mirror" the NGST CARD content as applicable. The NGST CARD content requirements are described below.

The purpose of the CARD is to establish the methods employed by the Contractor and the ground system to manage operational constraints and restrictions. The document shall provide implementation traceability from the CARD to the content of the ground system software and its supporting project database files.

Information shall be provided to describe how the constraints and restrictions are managed through ground system procedures, operational procedures and/or ground/flight software.

The NGST Constraints and Restrictions Document (CARD) shall include the following:

-Preface
-Abstract
-Change Information
-Table of Contents
1.0 Introduction
    1.1 Purpose and Scope
    1.2 Mission Overview
    1.3 Document Overview
    1.4 Context/Assumptions
    1.5 Applicable Documents
        1.5.1 Government Documents
        1.5.2 Non-Government Documents
    1.6 Updates and Revisions
2.0 NGST System Overview
    2.1 Observatory
    2.2 OTE
    2.3 Sunshield
    2.4 SSM
    2.5 ISIM
    2.6 OPE
    2.7 Science Instruments
        2.7.1 NIRCAM
        2.7.2 NIRSPEC
        2.7.3 MIR
3.0 Mission Operations Overview
4.0 NGST Constraints
    4.1 Spacecraft Constraints
        4.1.1 Structures and Mechanical Subsystems
        4.1.2 Instrumentation and Communication System
        4.1.3 Data Management Subsystem
        4.1.4 Pointing and Control Subsystem
        4.1.5 Electrical Power Subsystem
        4.1.6 Thermal Control Subsystem

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**

4.1.7 Safing System
4.2 OTE Constraints
4.2.1 General OTE
4.2.2 Fine Guidance Subsystem
4.2.3 Optical Control Subsystem
4.2.4 Electrical Power and Thermal Control Subsystems
4.2.5 Actuator Control Subsystem
4.3 Sunshield Constraints
4.4 SSM Constraints
4.5 ISIM Constraints
4.6 OPE Constraints
4.7 Science Instrument Constraints
4.7.1 NIRCAM Constraints
4.7.2 NIRSPEC Constraints
4.7.3 MIR
5.0 NGST Restrictions
5.1 Spacecraft Restrictions
5.2 OTE Restrictions
5.3 Sunshield Restrictions
5.4 SSM Restrictions
5.5 ISIM Restrictions
5.6 OPE Restrictions
5.7 Science Instruments Restrictions
5.7.1 NIRCAM Restrictions
5.7.2 NIRSPEC Restrictions
5.7.3 MIR Restrictions
-Appendices
-Abbreviations and Acronyms
-References
-List of Tables
-List of Figures

4.9.7 OPS-07 Operations Limitations Document

Description: The Operations Limitations Document (OLD) provides the results of contractor analyses of the instrument and identifies configurations and operations that could result in a loss of observing time or data.

SOW Reference: TBD

Content: The OLD will "mirror" the NGST OLD content as applicable. The NGST OLD content requirements are described below.

The NGST OLD shall provide NGST mission operations limitations. An operations limitation is identified as a practice or procedure that if violated will cause temporary loss of data, temporary degradation of components within the Observatory, cause subsystem inconvenience or loss of operating time but will not cause components damage.

The NGST Operations Limitations Document (OLD) shall include the following:

-Preface
-Abstract
-Change Information

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

-Table of Contents

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

5.7.1 NIRCAM Limitations
5.7.2 NIRSPEC Limitations
5.7.3 MIR Limitations
-Appendices
-Abbreviations and Acronyms
-References
-List of Tables
-List of Figures

4.9.8 OPS-08 Contingency Operations Plan

Description: The Contingency Operations plan provides preplanned instrument command and operation scenarios for recovery from and/or safing of the instrument in Contractor identified potential anomalous conditions.

SOW Reference: TBD

Content: TBD

4.9.9 OPS-09 Calibration Plan

Description: The Calibration Plan will provide inputs to the NGST Instrument Calibration Plan to be developed/maintained by the Science Operations Center. The plan details the instrument calibrations required for pre-launch ground based observations as well as describing the procedures for maintaining calibration parameters and algorithms for the mission. It will include an exhaustive list of all modes/capabilities that will be supported/calibrated and to what accuracy. Any modes/capabilities that will not be supported will be listed with justifications.

Note: The SI team performs analysis of the Science Instrument calibration data, from initial ground test through on-orbit commissioning, and the generation/delivery of the resulting Calibration Reference Database(s).

SOW Reference: TBD

Content:

- Details on pre-launch instrument calibration procedures
- Details on procedures for maintaining instrument calibration parameters
- Details on procedures for maintaining instrument calibration algorithms
- Input files for the NGST Science and Operations Center Calibration Reference Database

4.9.10 OPS-10 GTO Science Program

Description: This document describes the Guaranteed Time Observer (GTO) Science Program required for the development of the first NGST Call for Proposals. This informat5ion will be used to avoid duplication of the GTO observations, as required by NASA policy.

SOW Reference: TBD

Content: The document shall describe the GTO science program by providing the following:

- A title for each proposal comprising the science program
- An abstract for each proposal

CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.

- A target list giving the target name and celestial coordinates for each astronomical target in the program
- The requested SI configuration and integration time for each proposed observation

**CHECK THE NGST DATA BASE AT:
http://ngst1.hst.nasa.gov/SearchLib.asp
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE.**